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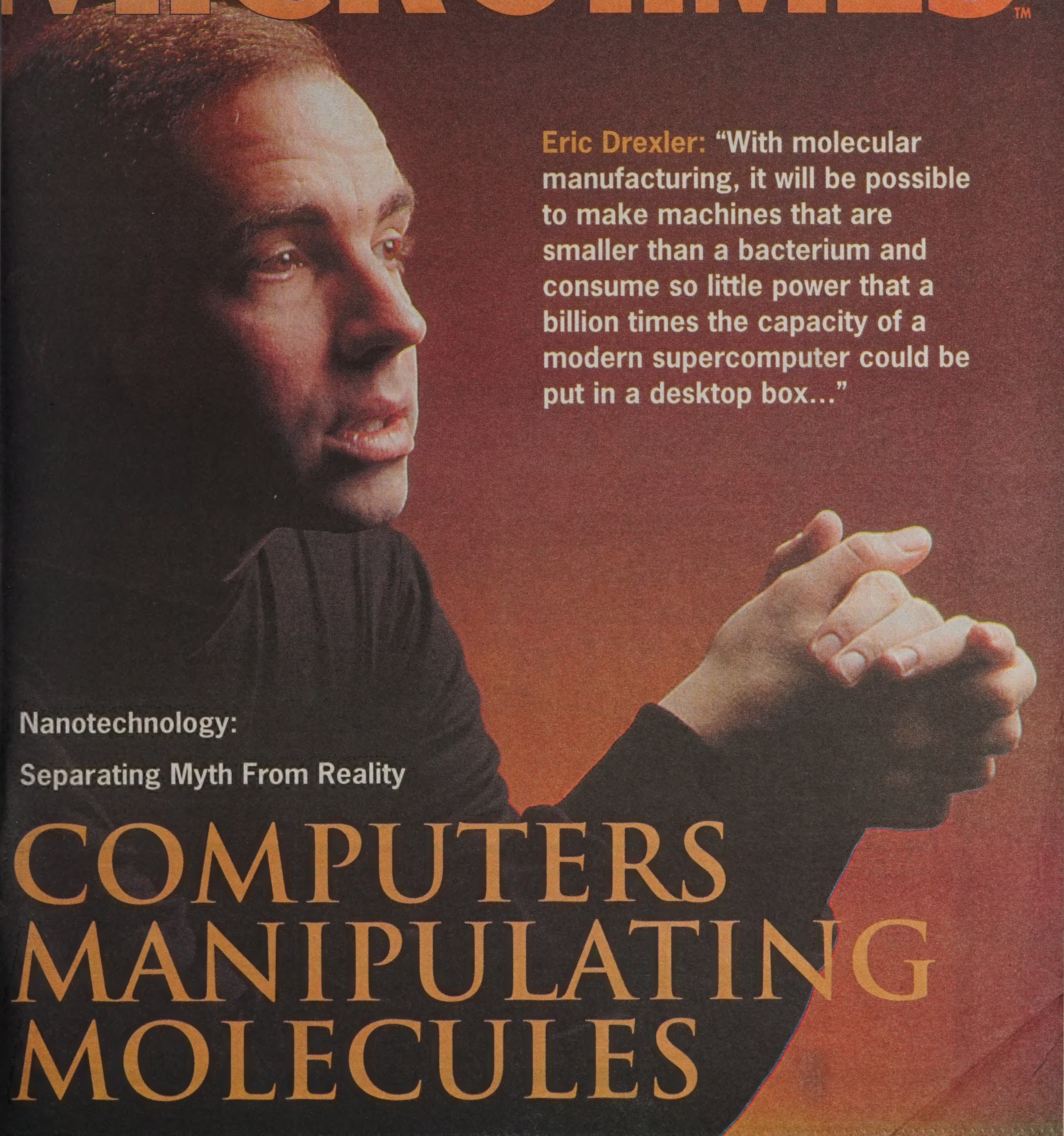

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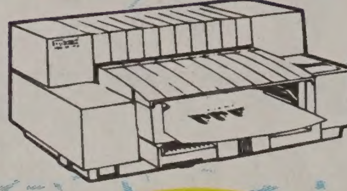

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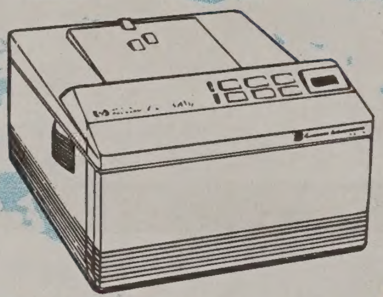

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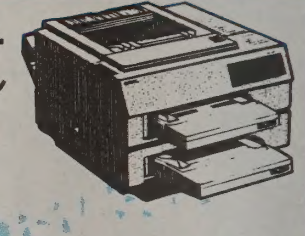

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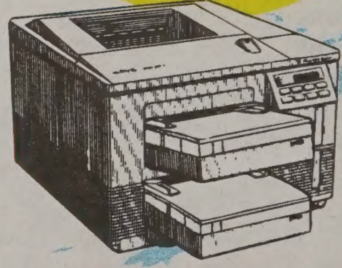

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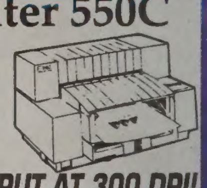

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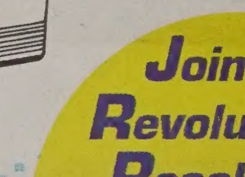

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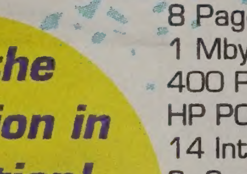

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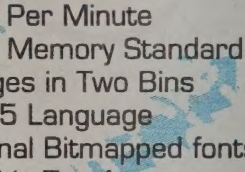

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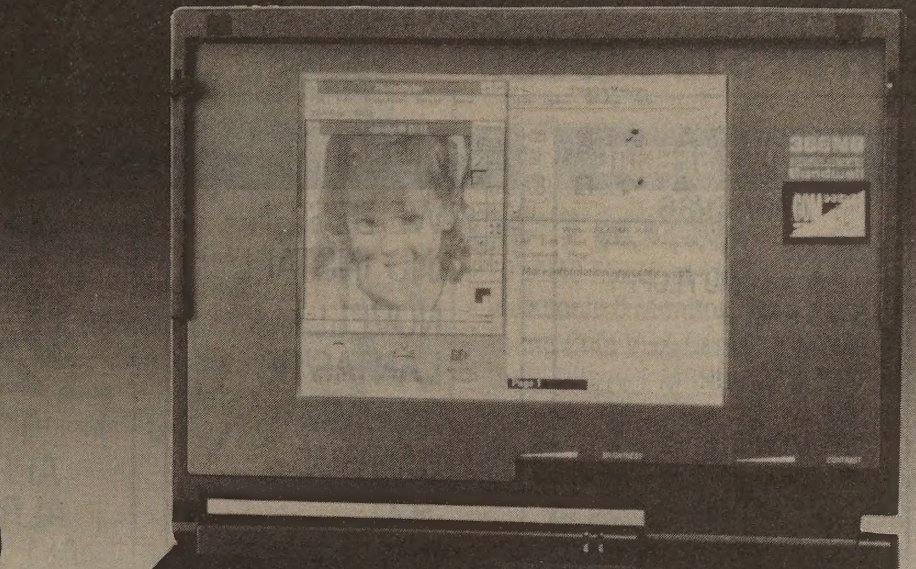

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A NOTE FROM THE EDITORS

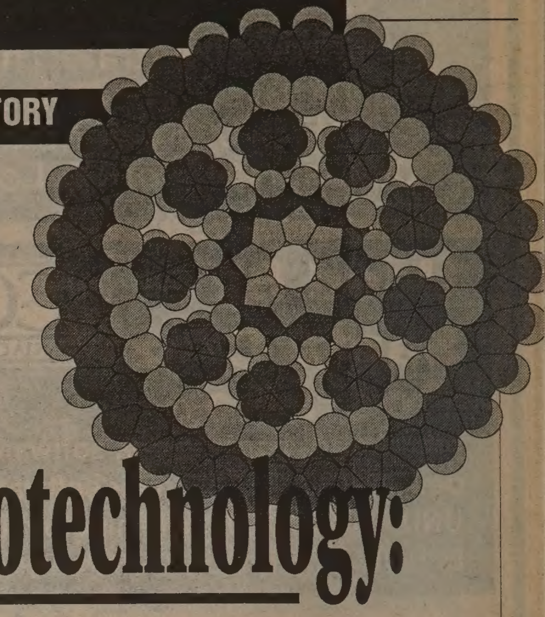
Normally when we get futuristic in our editorial coverage—with, say, virtual reality or pen-based computing in years past—we're talking about products that will become reality in the fairly near term. Our cover story this month deals with something that might not attain its fully realized state for decades—nanotechnology, the manipulation of matter at the molecular level. The implications are profound; the potential for world-changing technology and bogus vaporware is vast.

We're pleased to be able to bring you the views of two of the leading thinkers on the subject: Eric Drexler, author of numerous publications on the subject, most recently the forthcoming *Nanosystems*, and Autodesk co-founder John Walker, who, in our cover story interview in May, alluded to a manufacturing future in which a machine that can make anything will sit on our desktops.

We hope you find their ideas interesting and provocative.

—ME

COVER STORY



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Nanotechnology pioneer and researcher Eric Drexler discusses the implications of molecular manufacturing for the computer industry and the world at large.

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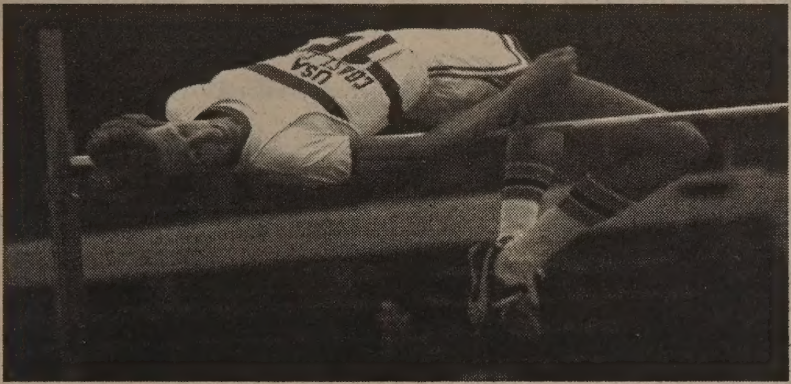

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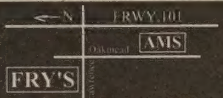

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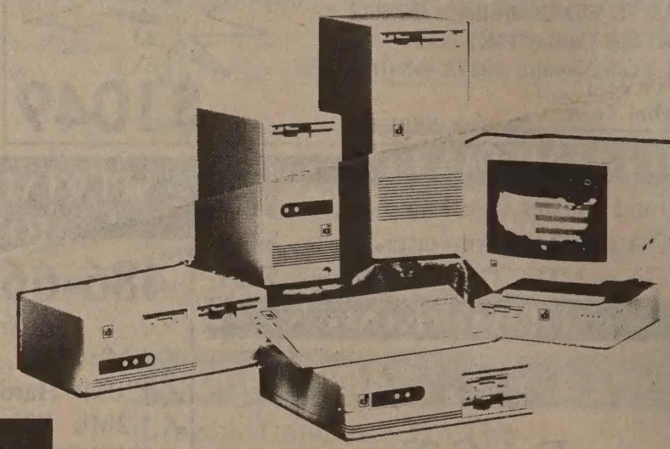

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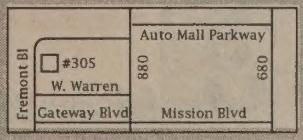

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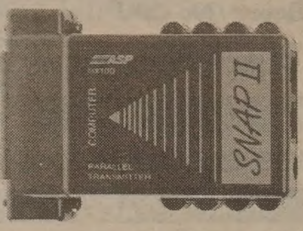

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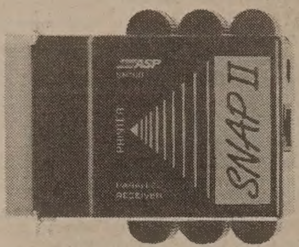

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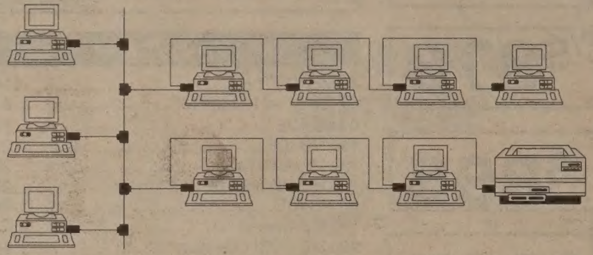

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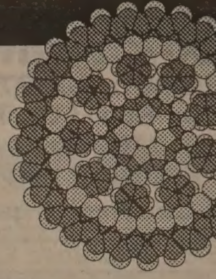

Jennifer Robin Cherniss is a free-lance writer living in Berkeley.

Marv Downey is the owner of Market Value Systems, a VAR specializing in real estate applications.

John C. Dvorak is a widely syndicated columnist, book author, and talk show host. He meets some strange people…

Bennett Falk works in tech support at Sybase.

Rich Grace is a free-lance writer who lives in Orange County.

Bill Gram-Reefer writes the Macintosh BBS News column in *Boardwatch* magazine and works as a publicist with Comstock Communications in Concord.

Mitsu Hadeishi is the founder of Open Mind, a San Diego-based software company.

Paul Hoffman is an industry analyst who's been writing about microcomputer technology for ten years, and is the author of several books on computer-related topics.

Ed Kahn is a writer and consultant based in the San Fernando Valley.

Contributing editor **Matthew Leeds** works at Brøderbund Software and writes about graphics and multimedia.

Woody Liswood is a consultant and frequent writer about PC-related subjects.

Mike Markowitz works in computer support at a major Southern California University, where frequent cries for help led to his writing the "Your First Computer" series.

David Morgenstern is a BMUG volunteer and works in the library at San Francisco State.

Robert Moskowitz is a business consultant based in Woodland Hills, CA. He writes frequently on productivity, office automation, and technology.

Doug Nakakihara is a CPA based in Simi Valley, and also a committed Amiga zealot.

Lee Ann Nelson is the owner of Nelson Design in San Ramon, and is responsible for the design of our covers and cover stories.

Tony Reveaux is the editor of *Computer Publicity News*, a contributing editor for *Artweek*, and the author of the "MediaScan" column in *Film/Tape World*.

Tom Schlegel is a consultant based in San Francisco.

David Simon, CPA, has a tax and accounting practice in Oakland.

Christine Soderberg is a Los Angeles-based writer and consultant specializing in human resources issues.

John Walker is a cofounder of Autodesk and currently works as a programmer in its European Technology Center in Switzerland.

Birrell Walsh works at KQED in San Francisco and writes on a variety of PC-related subjects.

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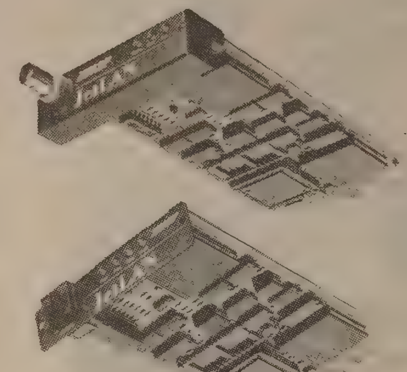

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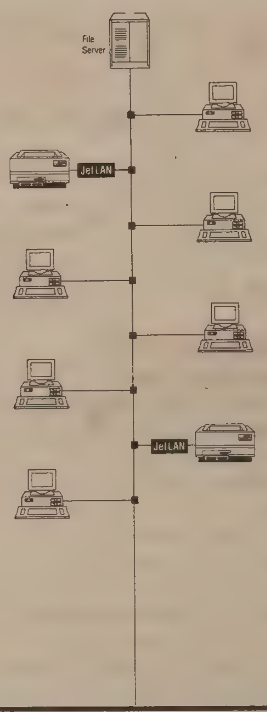

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EDITOR-IN-CHIEF
Dennis Erokan

PUBLISHER
Chuck Stanley

EDITORIAL 510-934-3700
EDITOR Mary Eisenhart
ASSISTANT EDITOR Michael Robin
NEWS EDITOR Paul Hoffman
ART DIRECTOR Lisa Lusk
SENIOR DESIGNER Monika Lukenbill Loar
CONTRIBUTING EDITORS Lenny Bailes, John Perry Barlow, John C. Dvorak, Bennett Falk, Mitsu Hadeishi, Ed Kahn, Matthew Leeds, Mike Markowitz, Brock Meeks, David Morgenstern, Douglas J. Nakakihara, Tony Reveaux, Birrell Walsh, Jim Warren, Wayne A. Yacco
CONTRIBUTING WRITERS Mikael Blaisdell, Anna Couey, Kathleen Creighton, Adam Gaffin, Rich Grace, Peter John Harrison, Fred Lieberman, Woody Liswood, Robert Moskowitz
CONTRIBUTING PHOTOGRAPHERS Jay Blakesberg, Michael Jay, Susana Millman, Ann Summa, Paul Winternitz

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Letters

SOME OF OUR VCS ARE MISSING?

There was only one thing missing in your 4th Annual Venture Capital issue—venture capitalists. While the articles presented were interesting, to me, as an entrepreneur looking for investment funding, the most valuable part of your yearly issue was the listing of venture capitalists, missing from this year's issue. I'm sure I wasn't the only one who noticed this. More than one of your readers plan to go into business for themselves.

> **"Your magazine over the years has been consistently interesting and informative, and has provided me with timely news on events/products of personal interest to me. That is why I was so disappointed with the VC section; I expected better."**

What I'd like to know is why was it omitted? The lists (which I transferred to disk) from previous years are of marginal usefulness at best; venture capital is an extremely volatile business.

Let me add that I'm not slamming the whole issue, your magazine over the years has been consistently interesting and informative, and has provided me with timely news on events/products of personal interest to me. That is why I was so disappointed with the VC section; I expected better.

Should you happen to have lists of *currently active* venture capitalists available that didn't

Continued on page 24

RUSSIANS SEEKING COMPUTERS

One of our contributing editors recently got a call from a friend in Moscow. He is an officer of the Russian equivalent of our Humanistic Psychology Association. They badly need some computers they can use for email to keep their scattered members in touch.

Old 286 machines with EGA or better would do fine for them. They need, of course, modems for them. Laptops with modems (even old luggables) are even better.

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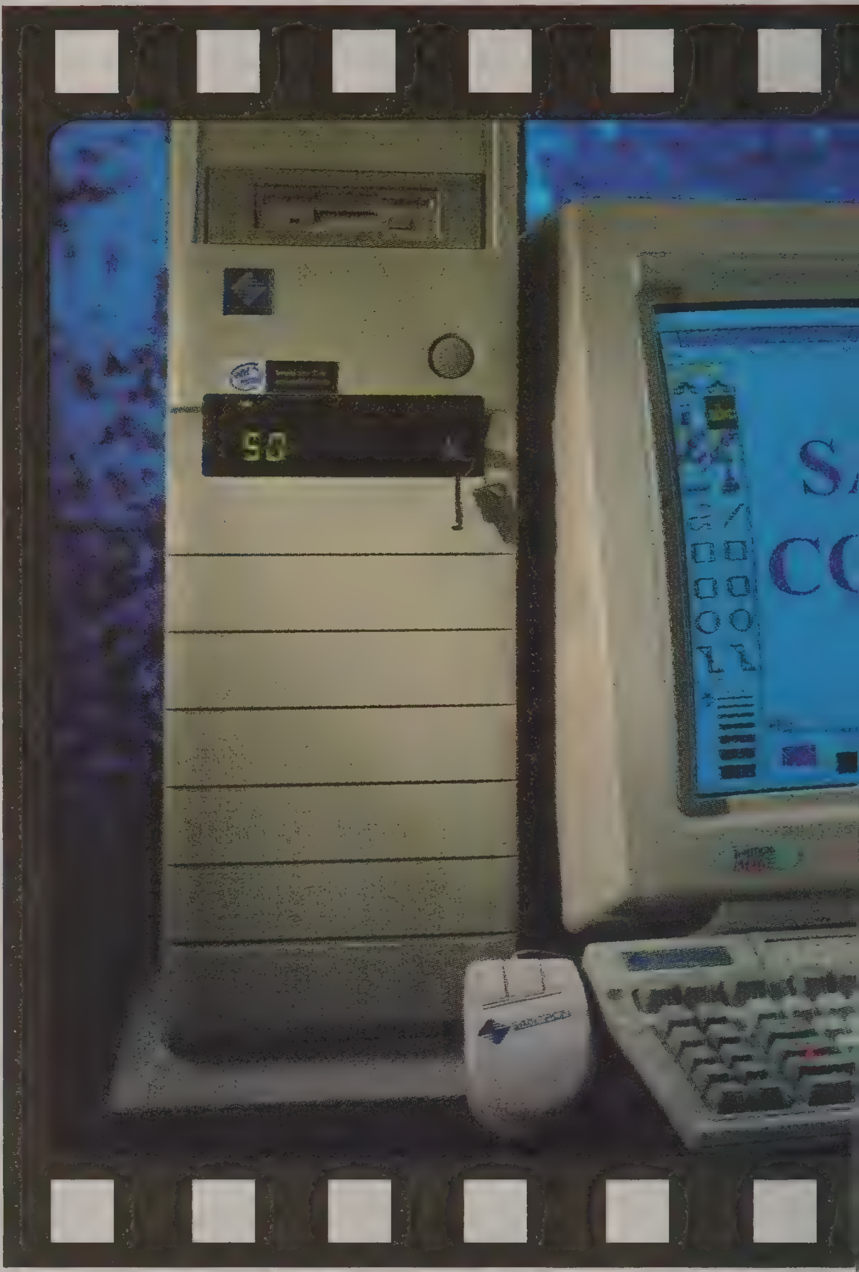

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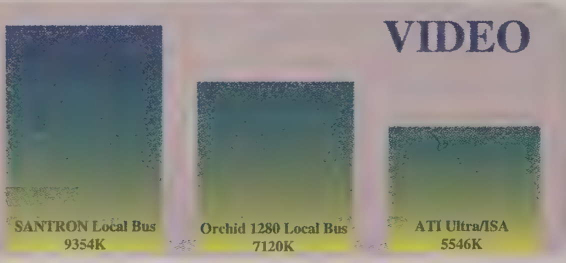

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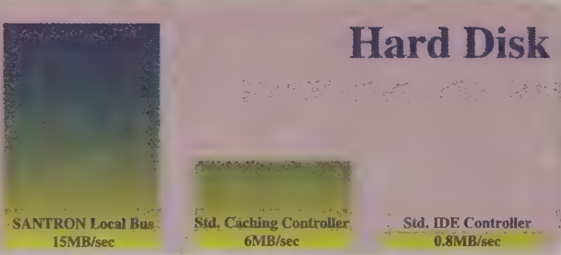

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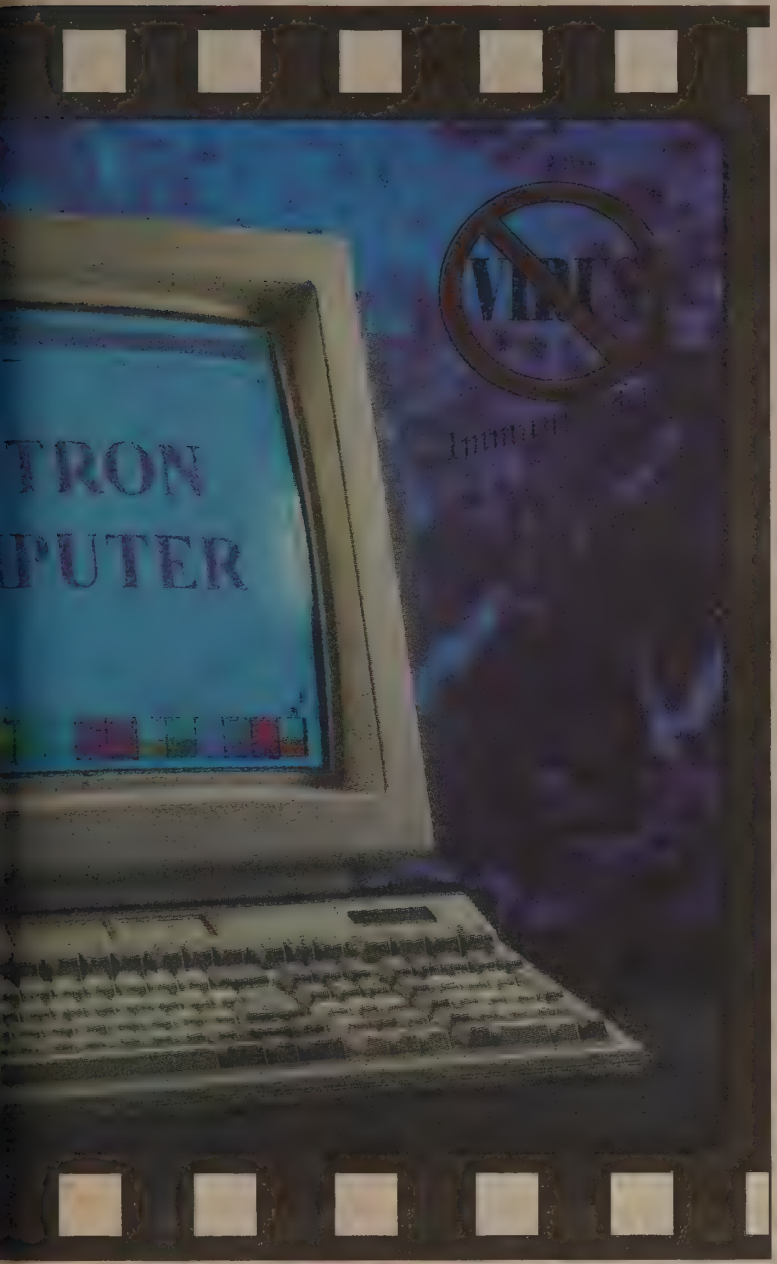

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Continued from page 14

make the issue due to space constraints, I'd really like to see them.

A. Lizard
Reptilian Associates
Moraga

The pseudonymous Mr. Lizard raises an interesting point, and we'd definitely like to hear from other readers on this matter, pro and con.

To answer his question: not unlike the industry we're trying to be responsive to, we're constantly performing minor adjustments to meet changing conditions. We're also trying to avoid wheel-reinvention, i.e. duplicating the sort of information that other publications are already doing a fine job with.

Over the last year, we've been impressed with the ongoing venture capital coverage (particularly, to address Mr. Lizard's query, its VC listings, paid and otherwise) to be found each month in Upside *magazine. We've also come to realize that a surprising number of people are unaware of its existence (or think it's one of those megabuck newsletters).*

So, on the one hand, we decided to try another approach with this year's venture capital coverage, one that didn't duplicate information widely available elsewhere.

And on the other hand, we're happy to point you in the direction of Upside *and its VC coverage. (*Upside*, $48 per year, 1159-B Triton Drive, Foster City, CA 94404; 415/377-0950, fax 415/377-1961.)*

—ME

BUT AT LEAST OUR BRAINS PROBABLY AREN'T MICROWAVED...

(In last month's Letters, reader John Lankes of San Francisco questioned the safety of microwave-based telecommunications, saying that a beam of 65 milliwatts, typical of such devices, is well above the ANSI safety standard of 1 milliwatt, and that 100-milliwatt doses have been known to kill laboratory rats. Mr. Lankes concluded with the statement that cellular phone users were literally microwaving their brains.—eds.)

Mr. John Lankes seems to have made the very fundamental error of confusing "total power level" with "power density."

A total power of 65 milliwatts would be distributed over a beam cross-section of roughly a square meter (10,000 square centimeters) for a typical short communication link. Thus the power density in the beam is about 6.5 microwatts per square centimeter, which is more than one hundred times weaker than the ANSI standard of 1 milliwatt per square centimeter quoted by Mr. Lankes.

David Reich
San Leandro

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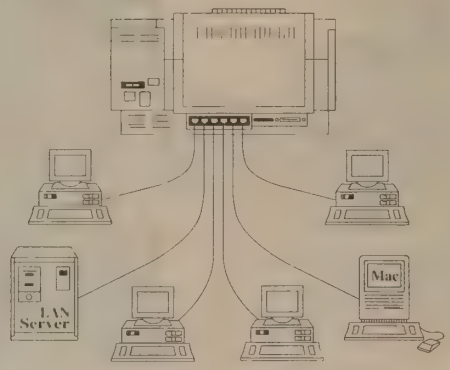

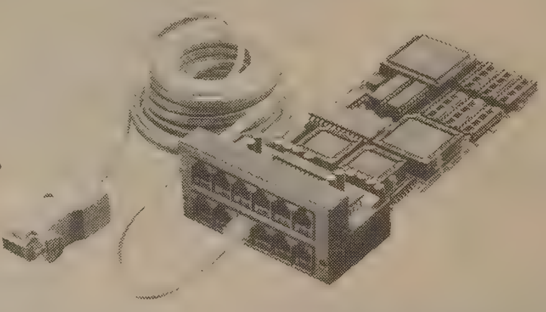

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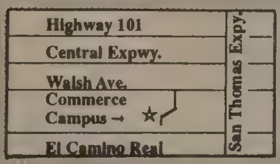

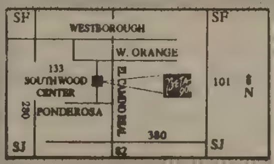

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INDUSTRY INSIGHT

Competition, Silicon Valley Style: Symantec And Borland Trade Charges On Trade Secrets

BY PAUL HOFFMAN

Lawsuits come and go in this industry, and many companies seem to feel that anything is acceptable as long as it is legal.

In a stunning case that shows how far the software industry has stooped, Symantec apparently hired Borland's vice president of programming products, Eugene Wang, and asked him (or at least allowed him) to communicate Borland product plans and proprietary financial data while he was still a Borland employee. Symantec also hired Wang's secretary, Lynn Georganas, who proceeded to take files from Borland after she had left the company.

At press time, Symantec has not denied any of Borland's charges, but has instead accused Borland of improperly bringing the dispute to the public and interfering with Symantec's methods of doing business. Symantec has said that because the dispute will be resolved in court, it is inappropriate to comment on specific charges. Symantec is dealing with the issue as a legal matter, while Borland is dealing with it as a public ethical matter. If found guilty, Wang and Georganas could spend time in jail. Borland has also sued Symantec in a separate civil case.

Job-hopping in high tech industries is common, although top executives do not often go to work for direct competitors of their previous employers without taking a few months or years off. Trade secret laws are usually enforced only in civil proceedings in which the executive's previous company sues the executive's new company to prevent it from using his or her knowledge. Most such cases are settled out of court, due to the difficulty in proving actual exchange of information.

The Borland-Symantec case is quite different. Borland suspected that Wang had taken trade secrets the day he left and searched his MCI Mail account (which was paid for by Borland). MCI Mail keeps copies of your recently-sent letters, and Borland found electronic mail to Gordon Eubanks, president of Symantec, containing trade secrets that were sent while Wang was still at Borland. With this evidence, Borland asked the local police to search Wang's and Eubanks' homes for evidence for a criminal case. According to reports, police found recent confidential salary reports at Wang's house and confidential Borland memos at Eubanks' house. Borland then obtained a standard restraining order against Symantec to return any confidential Borland information and not to destroy any relevant information.

The day after Wang left Borland, Georganas returned to Borland to retrieve what she called personal files. Two days later, after the restraining order had been issued, Georganas asked a personnel officer if she could retrieve more personal messages from her computer. It was arranged that she come in late in the evening to retrieve the additional messages. She copied one or two diskettes more of files onto floppy disks and deleted some files. As she left Borland's offices, Scotts Valley police met Georganas and took the floppies. Borland says that those floppies contain confidential material. Georganas then went to her new office at Symantec and turned over five more floppies to the police, which Borland claims also contain confidential material.

There are, of course, many issues here. From Symantec's view, the main issue is a legal one: did Wang and Georganas break any civil or criminal laws? Given that none of Symantec's press releases deny any of the facts and only chastise Borland for taking the situation public, Symantec tries to shift the blame onto Borland for not keeping the case only in the courts. Borland, on the other hand, by making public statements about what it perceives as the facts in the case, is not content to wait for legal judgments, seeing the issues as those of corporate ethics.

The computer industry has always been interested in the ethics of its major players. For example, when Apple sued Microsoft for the look and feel of Windows, the ethical ramifications were discussed more than the legal ones. The work environment at computer companies is often dissected in the media, particularly with respect to how such companies treat women. How a company conducts itself is significant to many people, and those for whom it is not simply ignore the news.

The market factors that led Symantec to take the steps cannot be ignored. Symantec has a small fraction of the computer languages market, where Borland and Microsoft dominate. Symantec is not known as an innovator in the computer language field, choosing instead to buy technologies. Wang's knowledge of what Borland was going to do in the next six months would be invaluable to Symantec in its positioning of new products. A major ethical issue is whether hiring someone with that kind of knowledge is the proper way to compete in the market.

The legal definition of "trade secrets" is vague and highly subject to the whim of a judge, and the industry has not tried to set down standards for the ethical definition. Regardless, Borland has as much right to go public with its view of the situation as Symantec does in defending itself. Waiting for years for a judgment doesn't serve the industry: it only serves the winning side in the case. If no one is interested in the ethical issues, Borland will look silly for trumpeting them; if the public is interested, Symantec will look sleazy for chastising Borland for "cre-

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It is ironic that Apple's first hardware recall comes at the end of the product's life. Apple's new, more powerful PowerBook portables have all but replaced the PowerBook 100, and dealers are offering the small notebook at cutthroat prices, often under $800. Apple was forced to recall 60,000 of the computers, however, to prevent the slight possibility that they might short-circuit and become very hot. Apple said that it only had three reports of the problem, but wanted to assure users that the systems are safe.

Only PowerBook 100s with serial numbers below SQ211 and below SS216 need the free modification. Computers with serial numbers equal to or greater than SQ211 and SS216 were not affected, because Apple changed the design immediately upon hearing of the first instance of the problem. Apple emphasized that only early PowerBook 100s are affected: no other PowerBook models have the problem due to a different system design.

If you have one of the affected PowerBook 100s, call Apple at 1-800-572-1731 to schedule an express pick-up of the computer. Apple will make the simple change to the system and return the unit, also by express delivery. Apple expects the total time users are without their systems to be about three days.

MICROSOFT'S LOW-COST SOUND SYSTEM

Years ago, Microsoft wanted everyone to buy mice for their PCs. At the time, mice were expensive and very few software titles had mouse capabilities built in. So Microsoft introduced an easy-to-use, low-cost mouse that quickly became the standard other companies had to compete with. Mice are now ubiquitous, and Microsoft Windows assumes that you have a mouse or similar device.

Following the same logic, Microsoft has shaken up the business sound market by introducing a low-cost sound board for Windows that allows you to record and play sounds at a much lower cost than competing systems. While some may accuse Microsoft of trying to elbow out current sound vendors, Microsoft sees this as the only way to assure that a significant percentage of business systems have sound capabilities. Currently fewer than 10% of systems running Windows have sound boards; if this strategy is successful, Microsoft could triple that number within a few years.

The Microsoft Windows Sound System (another Microsoft product with a really catchy title) consists of a sound board, headphones, a microphone, and software. The board has five connectors: speakers and headphones out, audio in, and microphone in. The quality of the sound coming from this $290 board is considered to be as good or better for most applications as what's produced by boards costing $1,000, so no one can accuse Microsoft of scrimping on the parts. It will work in any PC with a 386SX or better CPU.

The area in which the package really shines is the software. Without good software, Microsoft would be in the same position as every other board vendor who has a really hard time answering the question "What can I do with it?" The software, which Microsoft will license to other manufacturers, includes recording software, drivers for OLE so that sounds can be embedded into most recent Windows software, and entry-level voice command software. The Voice Pilot software

Continued on page 274

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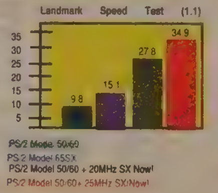

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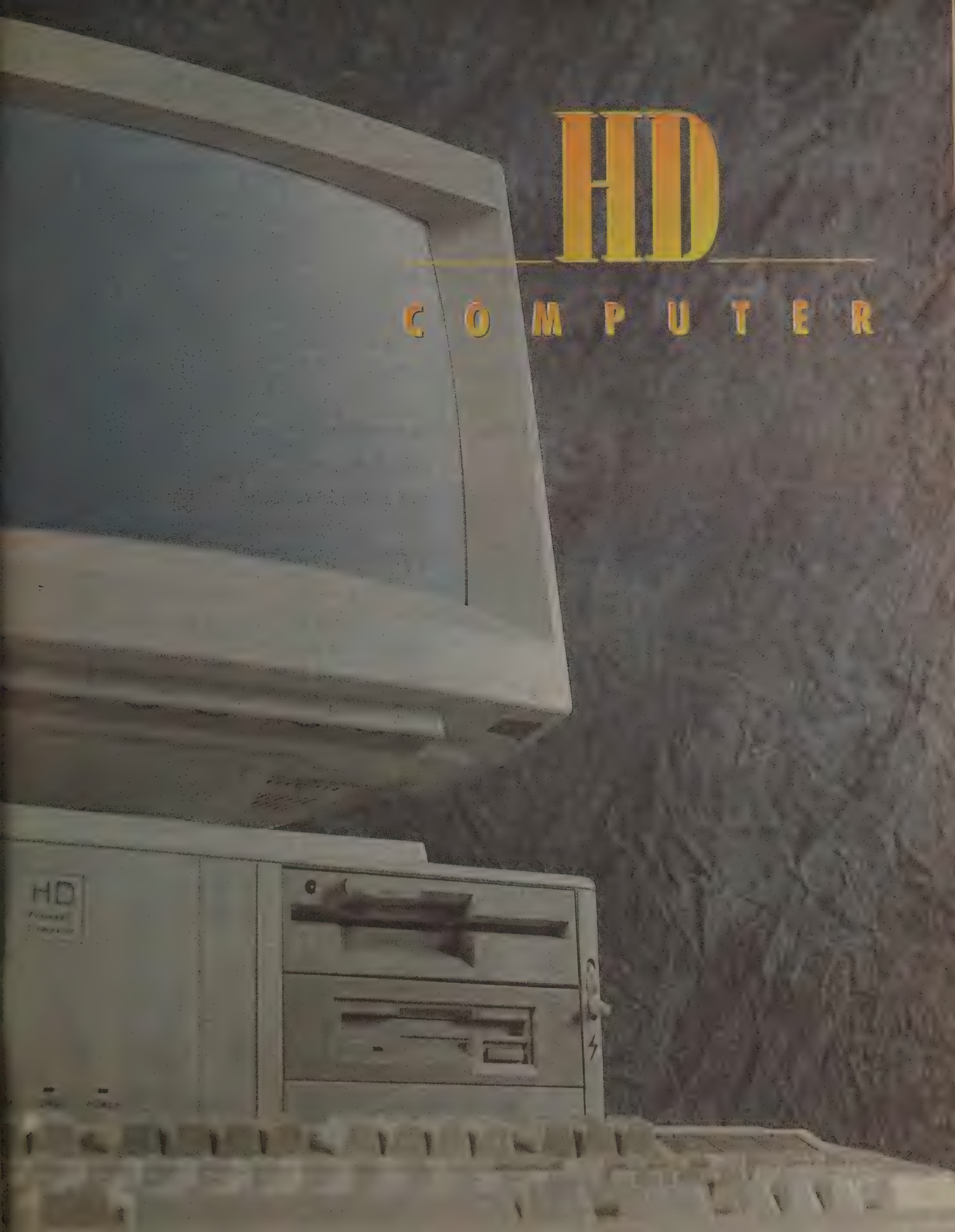
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PC Sources, March 1991, p347

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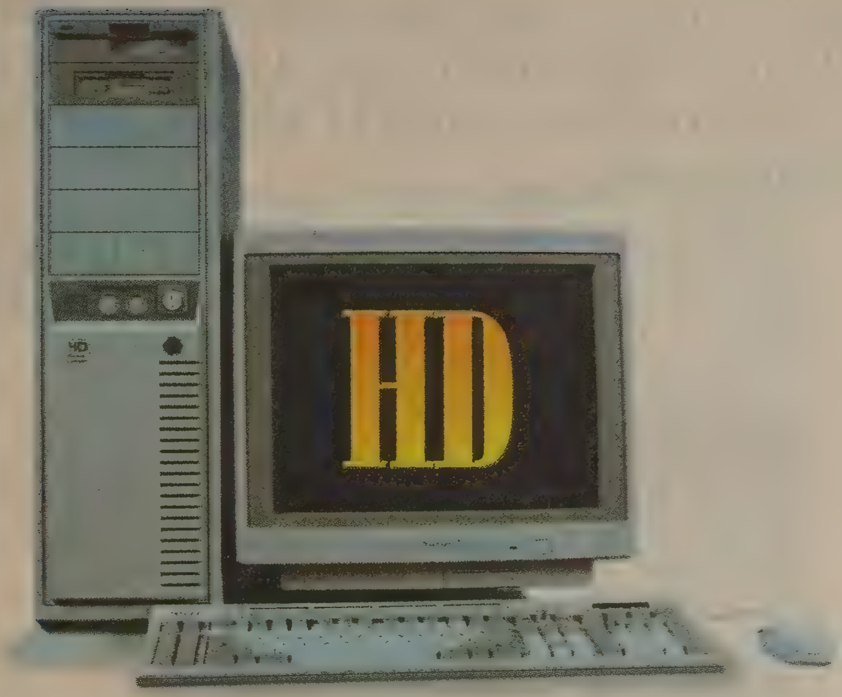

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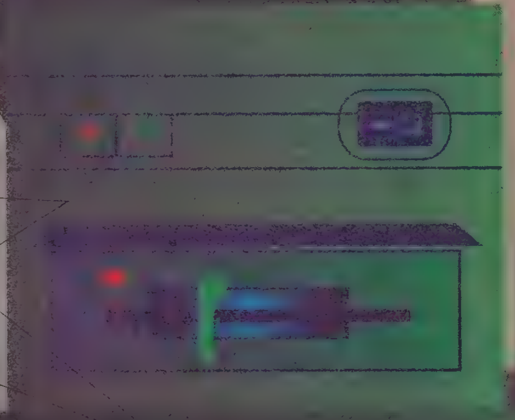

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REALIZABLE FANTASIES

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Warren founded InfoWorld, *the DataCast proposal for paperless electronic newspapers, Wireless Digital Initiative, Inc., and one of the nation's largest public microcomputer conventions. He was founding host of PBS's* Computer Chronicles, *founding editor of* Dr. Dobb's Journal, *and has chaired various trade and professionals' organizations. He holds graduate degrees in computing (Stanford), medical information science (UC Medical Center), and mathematics & statistics, and once chaired the College of Notre Dame-Belmont Mathematics Dept.*

He organized and chaired the landmark First Conference on Computers, Freedom & Privacy (1991), sponsored by a dozen nonprofit civic, professional, and industry organizations; and received one of the first Electronic Frontier Foundation Pioneer Awards (1992). He is a member of the board of directors of Autodesk, Inc.

Probably by the time you read this, our community's most important village project—local and national elections—will be finished. We, the electorate, will then receive exactly the quality of representation that we *earned* from our individual investments of time, energy, and resources—for we all know nothing's free.

Thus, we can contentedly rebury our heads in the delicious silicon sands of Techno-Deeds to Do—for instance:

A SHOCKINGLY SAFE SUGGESTION

Consider those relatively inexpensive, amazingly effective "invisible fences" for pets. They use a slightly buried boundary wire as an antenna for transmitting a very low-power, eccentric frequency pattern. The pet collar has a battery-powered receiver. When the collar—and presumably the pet—approaches within a few feet of the boundary/wire, the collar detects the unusual frequency pattern, gives a warning buzz, and then—if it doesn't back away—zaps the pet before it moves into traffic or within fang-distance of sidewalking citizens (we call 'em "litigants" in California). Brainstormed therefrom with our favorite Menlo Park idea-monger, John Nagle:

Offer a similar bracelet for ambulatory toddlers—preferably one that screeches rather than shocks—*before* they wander into pools, streets, or sidewalking candy-bearers. Of course parents who are undistractable and all-seeing have no need of this.

John also suggested putting a casino on Treasure Island in San Francisco Bay—helpful to politicians' unending tax-lust and to politically correct Las Vegas commuters desiring energy savings. He also mentioned suspending restaurants under various spectacular bridges—alongside proposed mass-transit rails. But, since these are non-computing fantasies, we'll leave them unmentioned.

DEFILED DOCUMENTATION

Micro users often manage hundreds or even thousands of systems programs, system extensions, utilities routines, TSRs, numerous versions of prefab/commercial software, self-generated programs, and mountains of datafiles required by all that software. In the ol' days, decent documentation—when it existed—told where the dozens of files that came with a software package were to be stored. Now, "Installer" programs wreak havoc by surreptitiously splattering mandatory and optional files and directories/folders all over the disk. Sometimes, they even delete "obsolete" files—with or without warning. Like IRS agents, they're here to help us.

Actually, Installers are dandy aids; but they shouldn't presume to replace intelligence. Software publishers using an Installer to install their software—creating directories and loading and deleting files—should include an Appendix in their documentation detailing their automated deeds. At the least, it should state:

1. What directories/folders may be created or modified,

2. What files must be or might be installed where—including name and size,

3. What directory and file names must remain unchanged and which may be renamed by the user,

4. Which files and subdirectories must remain in what directories on what disks and which paths can be changed with what restrictions,

5. Which sets of files and folders are required for which functionality, and

6. Maybe even a phrase exceeding two words describing the function of each such file and folder.

If for no other reason than to reduce tech-support calls and customer fury, publishers should give users who are *not* technically terrified the information needed to manage their/our systems.

We may not use technical information you provide, but we definitely won't use that which you keep secret. (Readers: Clip and mail to errant software publishers.)

It's difficult to use a word processor to fill in pre-printed forms. So word-processors should have a "transparency" option, where a scanned-in form can be displayed—in black, gray, or chosen color—exactly positioned with the word processor text that will be printed on it.

POCKET NETWORKING? OR IS IT A MICROWAVE?

Should we be looking forward to carrying cellular-networked pocket computers in our shirt pockets—right over our hearts? Should we be the first on our block to use the new, more powerful, 900MHz-band digital cordless phones?

I'm beginning to hear knowledgeable sources *allege* possible serious health hazards from hand-held cellulars—with antennas so near eye and brain. Allegation is that the eye is especially sensitive to cellular's base-frequency; reports tell of loss of color vision, an antenna-shaped brain tumor adjacent to usual antenna position, etc. Also hear that microwave health concerns are why hand-held cellular phones are limited to well under 1 watt of output-power, while luggables — with antennas [presumably] a few feet distant from the head—can be 3 watts. And then there's the unusual percentage of older radar cops showing up with testicular cancer—after years of holding their "safe" radar guns between their legs while writing tickets.

A research librarian searched for reports regarding risks from these broadcast bands, but found very little.

If you know of scientific research—preferably *not* funded by equipment manufacturers—about cellular-frequency microwave effects on adjacent biological material, please forward copies or pointers (address at end).

QUICKIES

Ever tried running "window" envelopes—the kind with the clear cellophane window through which the mailing address can (almost) be seen—through a (hot) laser printer? E.g. to custom-print logos or return-addresses on them? The window crinkles. Envelope-makers should offer laser-proof/heat-insensitive window envelopes.

Offer a bracelet similar to pets' electric-fence collars for ambulatory toddlers—preferably one that screeches rather than shocks—before they wander into pools, streets, or sidewalking candy-bearers. Of course parents who are undistractable and all-seeing have no need of this.

It's difficult to use a word processor to fill in preprinted forms. So word processors should have a "transparency" option, where a scanned-in form can be displayed—in black, gray, or chosen color—exactly positioned with the word processor text that will be printed on it. Note that this is different from printing the text *and* the scanned image of the form; it's for those cases where it is mandatory that the actual preprinted form be used, e.g. postal money orders, etc. (Variant on a hardware solution proposed by Marin County's Bob Bickford.)

Credit where credit's due/earned: Suffering from a case of memory-envy in early August, I wanted to inflict 8 megs o' memory on my Mac PowerBook. Phoned three supposedly competitive Silicon Valley computer stores. Prices were $239 to $479; while-you-wait installation was $45 to $95 in one to four hours. Fry's quote was best, so I walked in to their techno-junkie's heaven in Palo Alto about 4 pm on a weekday—and was out the door, a well-equipped happy camper, in 28 minutes, flat. Now that's *fast*!

And finally: We're told there's a politics BBS at (415)583-4102 (2400 baud)—astutely named, "Lies Unlimited."

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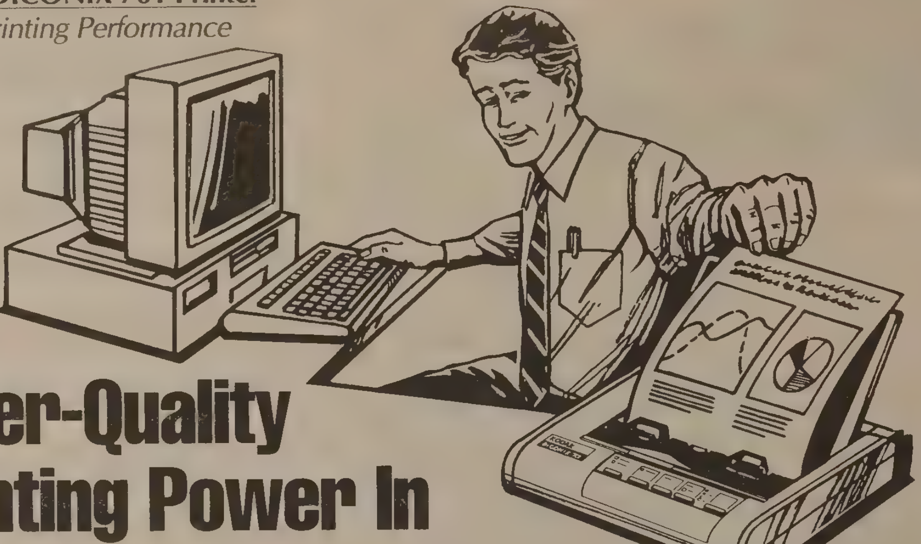

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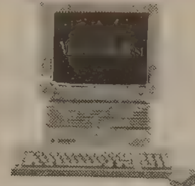

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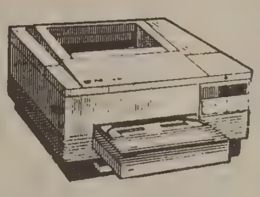

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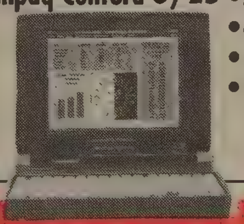

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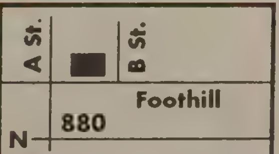

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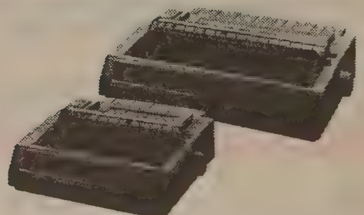

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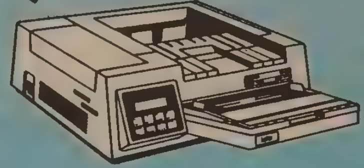

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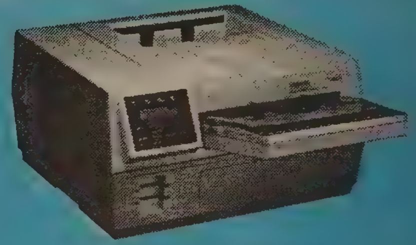

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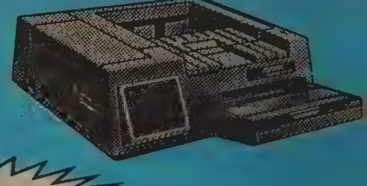

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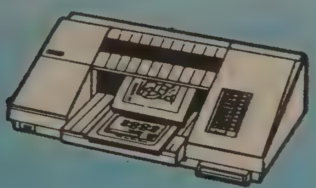

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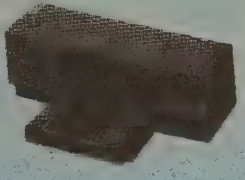

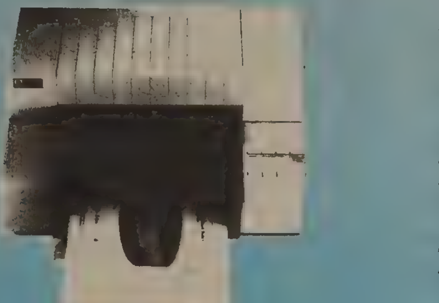

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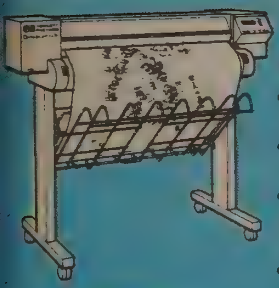

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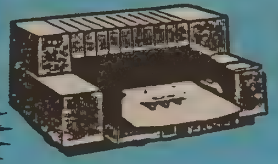

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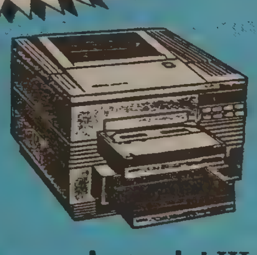

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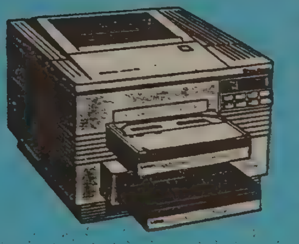

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Digital T

Industry Group Opposes FBI Proposal

In the just-adjourned session of Congress, the FBI proposed the Digital Telephony bill, which would require vendors and operators of communications equipment to make the equipment in such a way that it could immediately be wiretapped by law enforcement. In response, a number of organizations and companies from the industry, ranging from the ACLU to the Software Publishers Association and AT&T to Oracle, issued a white paper opposing the bill for reasons ranging from cost to reduced competitiveness.

The bill failed to come up for discussion during the session, but it's reasonable to assume that it will be back in some form next year. In a continuing effort to keep our readers informed about legislative issues affecting the computer industry—and to present source documents whenever possible—we present the bill itself (in its most recent language, which transfers the determination of standards to the Attorney General and sets fines of $10,000 per day for noncompliance), the FBI's arguments in its favor, and the entire text of the industry white paper opposing it.

These documents were provided by the Electronic Frontier Foundation. (155 Second St., Cambridge, MA 02141, 617/864-0665, eff@eff.org)

—eds.

THE DIGITAL TELEPHONY BILL

102nd Congress
2nd Session

S. _____
[H.R. _____]

IN THE SENATE
[IN THE HOUSE OF REPRESENTATIVES]

M. ________________ introduced the following bill; which was referred to the Committee on__________________

A BILL

To ensure the continuing access of law enforcement to the content of wire and electronic communications when authorized by law and for other purposes.

Be it enacted by the Senate and the House of Representatives of the United States of America in Congress assembled,

SEC. 1. FINDINGS AND PURPOSES.

(a) The Congress finds:

(1) that telecommunications systems and networks are often used in the furtherance of criminal activities including organized crime, racketeering, extortion, kidnapping, espionage, terrorism, and trafficking in illegal drugs;

(2) that recent and continuing advances in telecommunications technology, and the introduction of new technologies and transmission modes by the telecommunications industry, have made it increasingly difficult for government agencies to implement lawful orders or authorizations to intercept wire and electronic communications and thus threaten the ability of such agencies effectively to enforce the laws and protect the national security; and

(3) that without the assistance and cooperation of providers of electronic communication services and private branch exchange operators, the introduction of new technologies and transmission modes into telecommunications systems without consideration and accommodation of the need of government agencies lawfully to intercept wire and electronic communications would impede the ability of such agencies effectively to carry out their responsibilities.

Continued on page 42

elephony

FBI Arguments In Support Of The Bill

The telecommunications systems and networks are often used to further criminal activities including white collar and organized crime, racketeering, extortion, kidnapping, espionage, terrorism, and trafficking in illegal drugs. Accordingly, for many years, one of the most important tools in the investigation of crime for Federal and State criminal law enforcement agencies has been the court authorized interception of communications. As illustrated below, the majority of original authorizations to intercept wire or electronic communications are conducted by State criminal law enforcement agencies.

Interception Applications Authorized

	State	Federal	Total
1984	512	289	801
1985	541	243	784
1986	504	250	754
1987	437	236	673
1988	445	293	738
1989	453	310	763
1990	548	324	872
Total	3440	1945	5385

Approximately, 3/8 of authorized interceptions were conducted by Federal agencies, while 5/8 of the authorized interceptions were conducted by State criminal law enforcement agencies.[1]

The recent and continuing advances in telecommunications technology, and the introduction of new technologies by the telecommunications industry, have made it increasingly difficult for government agencies to implement lawful orders or authorizations to intercept wire and electronic communications, as well as to implement pen register and trap-and-trace court orders or authorizations. These new technologies inadvertently undermine the ability of criminal law enforcement agencies to enforce effectively the criminal laws and protect the national security. Without the assistance and cooperation of the telecommunications industry, these new technologies will impede the ability of the government to enforce the criminal law. Accordingly, the purpose of this bill is to clarify the existing responsibilities of electronic communication services providers and private branch exchange operators, as established, for example, in 18 USC. ____ 2518(4), 3124(A), (B), to provide such assistance as necessary to ensure the ability of government agencies to implement lawful orders or authorizations to intercept communications.

Over the past twenty-five years, the working relationship between the criminal law enforcement community, particularly the Federal Bureau of Investigation as the federal government's primary criminal

Continued on page 42

Industry Group Arguments Against The Bill

Analysis Of The FBI Proposal Regarding Digital Telephony

EXECUTIVE SUMMARY

Although the FBI has characterized its proposed "Digital Telephony" legislation as relating to the preservation of government's ability to engage in authorized wiretapping, the proposal actually requires that all communications and computer systems be designed to facilitate interception of private messages, on a concurrent and remote basis—thus imposing new engineering standards that go far beyond any existing law. As currently drafted, the proposal would impose substantial costs and create significant uncertainties, despite the absence of any clear showing that the proposed measures would be either effective or necessary. In addition, the proposal raises serious security and privacy concerns.

Beginning some time last year, the FBI has expressed concern that technological changes occurring in the telecommunications industry might have an adverse affect on the ability of law enforcement officials to conduct lawful, authorized wiretapping. For example, the FBI has raised questions about its ability to extract individual telephone calls from multiplexed signals sent over light fibers using new digital protocols. Various FBI proposals have generated concern on the part of industry that the security and privacy of electronic communications and computer systems might be weakened and that the competitiveness or technical advancement of various systems might be undercut. No one in industry challenges the FBI's right to cooperation in seeking to implement wiretaps or disagrees with the proposition that law enforcement officials need communications interception tools to do their vital job. The communications industry, network users and public interest groups are concerned with the broad sweep of the FBI's draft proposal and the potential uncertainties and costs it would impose. This memorandum explains the basis for those concerns.

Although the FBI proposal is described as relating to "digital telephony," it actually applies to all forms of communication, including all computer networks. The proposal requires that equipment be designed to give access to communications on a "concurrent" basis, regardless of the mobility of a target, in isolation from messages being exchanged by any other persons. These requests may have complex and differing application in different contexts, but they would certainly introduce additional costs and substantial uncertainties for both equipment manufacturers and everyone

Continued on page 46

FBI Arguments In Support Of The Bill

law enforcement agency, and the telecommunications industry, in response to the appropriate court orders or authorizations, has provided government agencies with timely access to the signals containing the content of communications covered by the court orders or authorizations. As a general proposition, this has involved providing the means to acquire the communication as it occurs between two individual telephone users at a remote location, not dissimilar to a call in which the two originating parties do not know that a third party is listening, and in which the third party (the criminal law enforcement agency) records the authorized and relevant calls.

Historically, and with relatively few exceptions, the telecommunications industry has provided the criminal law enforcement community with the ability to monitor and record calls:

1. at the same time as the call is transmitted to the recipient;
2. in the same form as the content of the call was transmitted through the network, notwithstanding the use by the target of custom features of the network;
3. whether stationary or mobile;
4. at the government monitoring facility;
5. without detection by the target or other subscribers; and without degrading any subscriber's service.

However, the introduction of new technology has begun to erode the ability of the government to fully effectuate interceptions, pen registers and trap-and-trace court orders or authorizations that are critical to detecting and prosecuting criminals. As technology has developed, the telecommunications industry has not always ensured the continued ability to provide the same services to the criminal law enforcement community. The telecommunications industry's introduction of certain types of new technology poses real problems for effective criminal law enforcement. Legislation is necessary to ensure that the government will be provided with this capability and capacity in the future by all providers and operators and to maintain a level playing field among competitive providers and operators in the telecommunications industry.

There have been instances in which court orders authorizing the interception of communications have not been fulfilled because of technical limitations within particular telecommunications networks. For example, as early as 1986, limited capabilities became apparent in at least one network which will only be corrected later in 1992. This technical deficiency in a new technology forced criminal law enforcement agencies to prioritize certain interceptions to the exclusion of other court orders. Accordingly, for approximately six years, there have been court orders that have not been sought by the criminal law enforcement community or executed by the telecommunications industry and, as a consequence, important criminal investigations have not been brought to fruition or have been less than efficiently concluded. This is one classic example of new technology affecting adversely the criminal law enforcement community: a microcosm of what may be expected on a nationwide basis without enactment of this legislation.

Section 1 of the bill states Congressional findings and purpose.

Section 2 is divided into seven subsections. Subsection (a) establishes as a matter of law the responsibility of electronic communication services providers and private branch exchange operators to continue to provide, within the United States, the capability and capacity for criminal law enforcement agencies to intercept wire and electronic communications when authorized by law. These subsections delineate the existing attributes of wire or electronic communication interception.

1. Concurrent with Transmission. The application for a court order to intercept telecommunications conversations or data transmissions is rarely a leisurely process. For example, on the Federal side, the development of the required affidavits, submission to the Criminal Division of the Department of Justice for approval, transmission of approval to the Assistant United States Attorney, the appearance of the Assistant before a judge to request the order and the delivery of the judge's order to the appropriate telecommunications company is frequently completed in a very short time. However, crime waits for no one and the system for approval of interceptions must and does conform with the realities of the activity that is sought to be investigated and, if appropriate, prosecuted as criminal offenses. Since time is of the essence, current law requires that service providers and operators provide the government forthwith all information, facilities and technical assistance necessary to accomplish its mission. It is critical that the telecommunications industry respond quickly to execute the court order or authorization. The ultimate problem of timeliness, however, is the real-time monitoring of the intercepted communications. As serious and potentially life-threatening criminal conduct is detected, it may be necessary to move quickly to protect innocent victims from that conduct. Accordingly, "real-time" monitoring is critical.

2. Isolated Signal and Services Used. Nearly all of the communications network is par-

---

Footnotes

1 Interceptions for foreign intelligence and counterintelligence purposes are not counted within the figures used here, but would likewise benefit from enactment of the legislation.

2 Whether the content is voice, facsimile, imagery (e.g. video), computer data, signalling information, or other forms of communication, does not matter; all forms of communication are intercepted.

THE DIGITAL TELEPHONY BILL

(b) The purposes of this Act are to clarify the responsibilities of providers of electronic communication services and private branch exchange operators to provide such assistance as necessary to ensure the ability of government agencies to implement lawful court orders or authorizations to intercept wire and electronic communications.

SEC. 2.

(a) Providers of electronic communication services and private branch exchange operators shall provide within the United States capability and capacity for the government to intercept wire and electronic communications when authorized by law:

(1) concurrent with the transmission of the communication to the recipient of the communication;

(2) in the signal form representing the content of the communication between the subject of the intercept and any individual with whom the subject is communicating, exclusive of any other signal representing the content of the communication between any other subscribers or users of the electronic communication services provider or private branch exchange operator, and including information on the individual calls (including origin, destination and other call set-up information), and services, systems, and features used by the subject of the interception;

(3) notwithstanding the mobility of the subject of the intercept or the use by the subject of the intercept of any features of the telecommunication system, including, but not limited to, speed-dialing or call forwarding features;

(4) at a government monitoring facility remote from the target facility and remote from the system of the electronic communication services provider or private branch exchange operator;

(5) without detection by the subject of the intercept or any subscriber; and

(6) without degradation of any subscriber's telecommunications service.

(b) Providers of electronic communication services within the public switched network, including local exchange carriers, cellular service providers, and interexchange carriers, shall comply with subsection (a) of this section within eighteen months from the date of enactment of this subsection.

(c) Providers of electronic communication services outside of the public switched network, including private branch exchange operators, shall comply with subsection (a) of this section within three years from the

Continued on page 45

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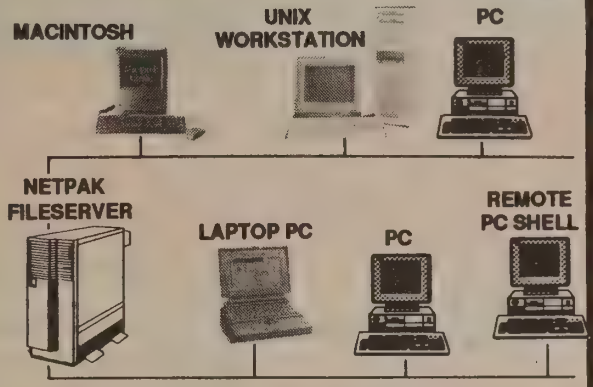

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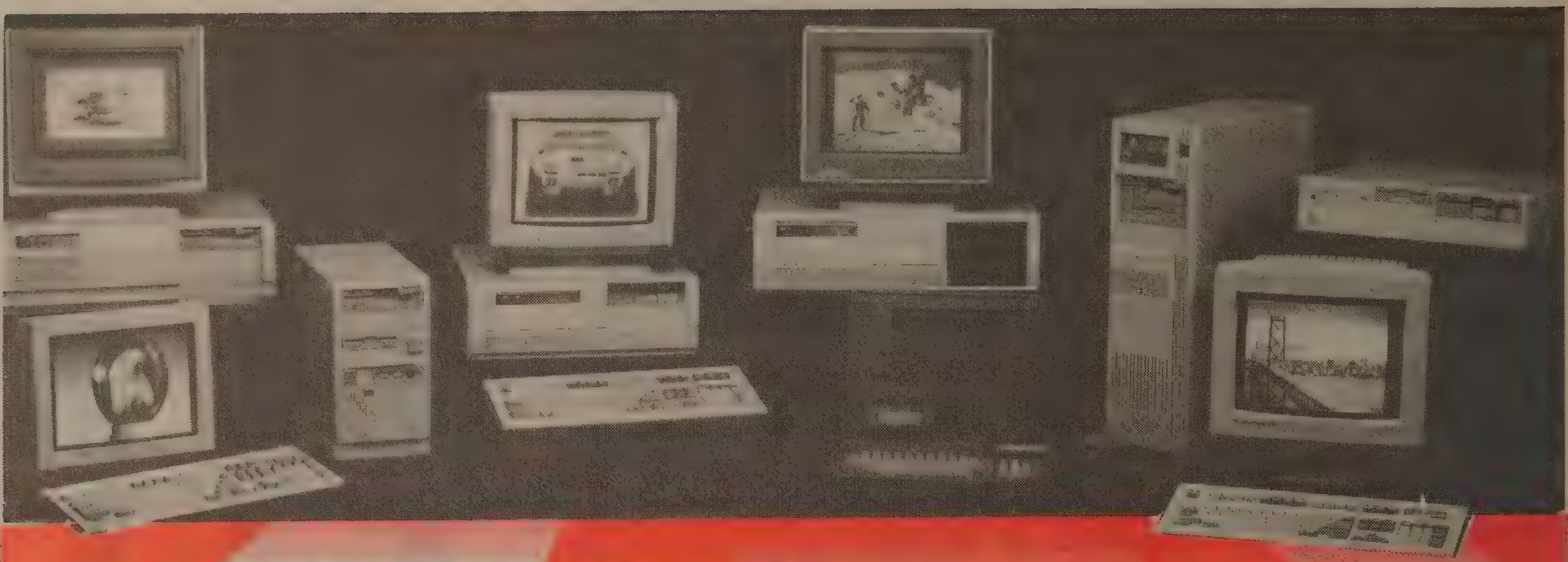

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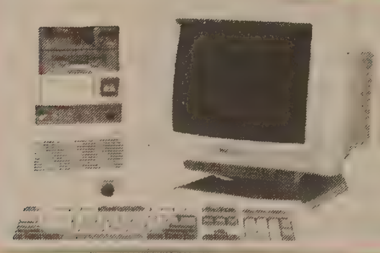

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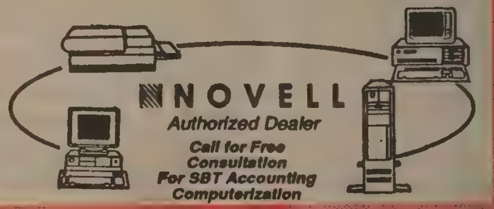
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FBI Arguments In Support Of The Bill

tially "analog" at this time. In conducting an interception, for example, of a telephone conversation, the government is allowed to monitor and record criminal conversation such as a conspiracy, minimizing the acquisition of non-criminal or innocent conversation. When an electronic communication services provider or private branch exchange operator introduces a new technology—such as a digital signal—the communications are converted into a different and more efficient form for transmission, but a more difficult form to monitor during interception. The bill requires only that the provider or operator isolate and provide access to the electronic signal that represents the content of the communications of the target of the intercept[2] from the stream of electronic signals representing other communications. This provision seeks to ensure that, in the new electronic environment in which signals are mixed for transmission and separated at another switch for distribution, the government does not receive the communications of any individual other than the individuals using the target's communications point of origin and receipt; the government must remain subject to the minimization standards of 18 USC. __ 2518(5).

This provision also makes it clear that an electronic communication services provider or private branch exchange operator is not required to provide for reconversion of the isolated communication to analog or other form. The government expects that this process will be accomplished by the government.

3. Mobility and Features. Increasingly, criminal acts are being conducted or discussed over cellular telephones or by using special telecommunications features. As this mobility is introduced, the electronic communication services providers and private branch exchange operators would be required to assure the capability and capacity for criminal law enforcement agencies to continue lawful interception.

Further, this subsection makes it clear that features used by the target do not defeat the court order or authorization. For example, communications which have been addressed to the telephone number of the target, but which may have been programmed through a call-forwarding feature to another, otherwise innocent, telephone number, must be captured and made available to criminal law enforcement authorities pursuant to court order or authorization. This requirement will obviate the need for applications for authority to monitor otherwise innocent telephone numbers that receive, only intermittently, calls forwarded by the target. The effect of this provision is to further minimize monitoring of calls of innocent parties. Similarly, certain speed dialing features that mask the telephone number called by the target must be identified for criminal law enforcement investigation. The ability to consistently determine the destination of calls is critical to minimizing the monitoring of innocent calls.

4. Government Monitoring Facility. Government agencies do not normally request the use of telecommunications industry physical facilities to conduct authorized interceptions nor is it encouraged by the industry. Normally, the government leases a line from the electronic communication services provider's or private branch exchange operator's switch to another location owned or operated by the government. This minimizes the cost and intrusiveness of interceptions, which benefits the service provider or operator, as well as the government. Accordingly, the ability to monitor intercepted communications remotely is critical.

5. Without Detection. One of the reasons that governments operate their own facilities is to reduce the risk of detection of the interception, which would render the interception worthless. At the present time, the existence of an interception is unknown to any subscriber and is not detectable by the target, notwithstanding folklore and spy novels. This provision merely ensures that the secrecy of effective interceptions will be maintained.

6. Without Degradation. Maintaining the quality of the telephone network is in the interest of the government, the industry and the public. Presently, the existence of an interception has no effect on the quality of the service provided by any network to the target or any subscriber. This provision ensures that the quality of the network will continue to be uncompromised. Absent the assistance delineated by this legislation, the execution of court orders and authorizations by the government could well disrupt service of the newer technological systems, a result that this legislation seeks to avoid.

Subsection (b) provides that electronic communication services providers and private branch exchange operators within the "public switched network" must be in compliance with the minimum intercept attributes within eighteen months after enactment. Thereafter, new technologies must continue to meet these minimum attributes.

Subsection (c) provides that electronic communication service providers and private branch exchange operators that are not within the "public switched network" must be in compliance with the minimum intercept attributes within eighteen months after enactment. Thereafter, new technologies must continue to meet these minimum attributes.

THE DIGITAL TELEPHONY BILL

date of enactment of the subsection.

(d) The Attorney General, after consultation with the Department of Commerce, the Small Business Administration and Federal Communications Commission, as appropriate, may except from the application of subsections **(a)**, **(b)** and **(c)** of this section classes and types of providers of electronic communication services and private branch exchange operators. The Attorney General may waive the application of subsections **(a)**, **(b)** and **(c)** of this section at the request of any provider of electronic communication services or private branch exchange operator.

(e) The Attorney General shall have exclusive authority to enforce the provisions of subsections **(a)**, **(b)** and **(c)** of this section. The Attorney General may apply to the appropriate United States District Court for an order restraining or enjoining any violation of subsection **(a)**, **(b)** or **(c)** of this section. The District Court shall have jurisdiction to restrain and enjoin violations of subsection **(a)** of this section.

(f) Any person who willfully violates any provision of subsection **(a)** of this section shall be subject to a civil penalty of $10,000 per day for each day in violation. The Attorney General may file a civil action in the appropriate United States District Court to collect, and the United States District Courts shall have jurisdiction to impose, such fines.

(g) Definitions—As used in subsections **(a)** through **(f)** of this section—

(1) 'provider of electronic communication service' or 'private branch exchange operator' means any service or operator which provides to users thereof the ability to send or receive wire or electronic communication, as those terms are defined in subsections 2510(1) and 2510(12) of Title 18, United States Code, respectively, but does not include the government of the United States or any agency thereof;

(2) 'communication' means any wire or electronic communication, as defined in subsections 2510(1) and 2510(12) of Title 18, United States Code;

(3) 'intercept' shall have the same meaning as set forth in section 2510(4) of Title 18, United States Code; and

(4) 'government' means the Government of the United States and any agency or instrumentality thereof, any state or political subdivision thereof, the District of Columbia, and any commonwealth, territory or possession of the United States. ■

Industry Group Arguments Against The Bill

who offers messaging service to others. These days, the list of those covered by the proposal ("providers of electronic communications services" and "PBX owners") includes just about everyone. Because the wiretap statute was written to protect the privacy of a broad range of communications types, and because of the growing interdependence and intermixing of all forms of communications, the statutory language of the FBI proposal could turn out to require redesign or expensive alteration of:

(1) public electronic mail systems, like those offered by MCI, AT&T and a host of other companies and individuals;

INDUSTRY: "Although current wiretap law requires 'minimization' and use of wiretaps as a 'last resort,' the proposal imposes obligations on all communications systems as if preserving the ability to wiretap at any point should be the system designer's highest priority."

(2) all telephone switches and the sophisticated equipment used by long distance carriers;

(3) software used by online information services like Prodigy, GEnie, CompuServe, America Online and many others;

(4) local area networks, linking all kinds of computers, operated by small businesses, colleges and universities and many other types of organizations, including links into these systems from other homes and offices;

(5) PBXs owned by small and large businesses;

(6) high speed data networks connecting workstations with mainframes and supercomputers, as well as those carrying messaging traffic across the "Internet";

(7) radio-based and cellular communications systems, including pocket telephones and computers with radio-based modems;

(8) the thousands of small personal computers owned by businesses, hobbyists, local governments, and political organizations that communicate with others via computer bulletin boards;

(9) private metropolitan wide area communications systems used by businesses such as large banks;

(10) satellite uplink and downlink equipment supporting radio and television transmissions and other communications; and

(11) air-to-ground equipment serving general aviation and commercial aircraft.

We are becoming an information economy and, accordingly, imposing mandatory system design requirements on all those involved in the transfer of information has an impact on large numbers of people and most sectors of the economy.

There is no doubt that evolving technologies will challenge law enforcement officials and industry alike. We need effective law enforcement tools, as well as appropriate levels of privacy and security in communications and computer systems. The goals underlying the FBI proposal are valid and important ones. But they may well be best achieved without additional legislation. Industry has historically cooperated with law enforcement and is presently engaged in ongoing discussions to identify specific problems and concrete solutions. This cooperative process will lead to needed exchanges of technical information, better understanding on all sides of the real policy issues, and better, more cost-effective solutions. Congress should reject the FBI proposal and encourage continuing discussions that will lead to more specific identification of any problems and to more concrete, cost-effective solutions.

Analysis of the FBI Proposal Regarding Digital Telephony

What is Proposed? The most recent proposal imposes obligations to provide various generic interception "capabilities and capacities" and empowers the Attorney General to grant exemptions, after consultation with the Federal Communications Commission, the Department of Commerce and the Small Business Administration. Any person who manufactures equipment or provides a service that failed to comply with the broad and vague requirements of the proposed statute would be subject to a civil penalty of $10,000 per day.

How Serious is the Problem? The predicate for the FBI proposal is that advances in technology have made it more difficult for the government to intercept particular telephone conversations in the course of legally-authorized wiretapping. There have been few actual problems, historically, in executing authorized wiretaps. None have stemmed from

Continued on page 192

FBI Arguments In Support Of The Bill

Subsection (d) provides that the Attorney General may grant exceptions to the affirmative requirements of subsection (a), as well as the implementation deadlines of subsections (b) and (c). In considering any request for exception, the Attorney General will consult with Federal Communications Commission, the Small Business Administration and the Department of Commerce, as appropriate. Accordingly, the Attorney General has the authority to except, for example, whole classes, categories or types of private branch exchange operators where no serious criminal law enforcement problems are likely to arise.

This subsection also permits the Attorney General to waive the requirements of subsections (a), (b) and (c) on application by an electronic communication services provider or private branch exchange operator. Accordingly, if a particular company can not comply with one or more of the requirements of subsection (a), or needs time additional to that permitted under subsections (b) or (c), the Attorney General may grant an appropriate waiver.

Subsection (e) provides that the Attorney General has exclusive authority to enforce the provisions of the bill. While a number of States have authority to seek and execute interception orders, they will be required to seek the assistance of the Attorney General if enforcement of this legislation is required. This section also provides for injunctive relief from violations of the provisions of the bill.

Subsection (f) provides for enforcement of the provisions of the bill through imposition of civil fines against any company that is not excepted from the provisions of the bill, does not acquire a waiver of the provisions of the bill, and fails to meet the requirements of subsection (a) after the effective dates set out in subsection (b) or (c), as appropriate. A fine of up to $10,000 per day for each day in violation may be levied; for most companies in the telecommunications industry this amount is sufficient to ensure that compliance will be forthcoming. Although this provision is not expected to be used, it is critical to ensure that compliance with the provisions of the bill will occur after the effective dates of the requirements of subsection (a).

Subsection (g) carries forward a number of definitions from the current provisions for the interception of wire or ele tronic communications under "Title III." The definition of "government" that is currently in use includes all States, territories and possessions of the United States, as well as the United States, is made applicable to the bill. ■

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BUSINESS SOLUTIONS

The New Improved 95LX

Also: Third-Party Support, Wireless Telecommunications, And More

BY MITSU HADEISHI

Since the Hewlett-Packard 95LX was released early last year, demand for this small PC-compatible palmtop has far outstripped HP's original projections. HP itself was not really prepared for this; at first, demand greatly exceeded supply, and though the machine is now readily available in the stores, direct support from HP is still relatively sparse. As a result, support networks have begun to surface among avid 95LX owners in the form of third-party newsletters and accessories.

This 95LX is currently available in two varieties: the original 512K version, which now retails for $599, and the newer 1MB version, currently with a list price of $699. The unit measures 6" x 3.5" x 1", and weighs in at a light 11 ounces. This makes it slightly smaller and somewhat thicker than the Sharp OZ-8000, and about the same overall size as a Psion Series 3.

The screen is capable of displaying sixteen lines by forty columns of text. The operating system is DOS, which means you can run any number of DOS applications directly, and there are now hundreds of DOS applications which have been specially converted to use the 95LX's smaller display. A number of programs are built into ROM, most notably a complete version of Lotus 1-2-3 Release 2.2, and organizer functions such as a calendar, to-do list, memo pad, address book, financial calculator, and a simple communications program.

Open, the unit displays its HP calculator lineage; the keyboard is made up of small, squarish calculator-like keys, spaced quite close together to accommodate a numeric keypad on the right-hand side of the unit. Though this makes quick typing difficult, the excellent tactile feedback of the keys helps. The machine also features a PCMCIA 1.0 card slot, primarily for memory expansion (up to 2MB per card) or ROM application cards, as well as a built-in serial port and infrared port for communicating with another 95LX.

The design of the built-in applications is somewhat less intuitive than the equivalents on many dedicated palmtop organizers; the user interfaces are generally more clunky, and, because the unit is DOS-based, it is not quite as easy to run multiple applications at the same time. For example, you can run any standard DOS application, but before you are allowed to do this, you have to "quit" any of the other applications that happen to be running (and save the data to a simulated disk file). This is somewhat less intuitive than the operation of other, non-DOS organizers (like the Sharp Wizard or the Psion 3), which have special-purpose operating systems designed specifically to support multiple simultaneous applications. The built-in applications, however, are specially designed to coexist with each other and run "at the same time."

Another drawback to the use of DOS as a palmtop operating system is that data is often duplicated when you're editing it. Data which resides on the simulated disk is read into memory as well, meaning you have information on the simulated disk as well as in RAM, effectively halving the total amount of data that can be used in a particular application. This problem can be ameliorated by carefully written applications designed for palmtop use, but the typical DOS application is not usually written to efficiently use a palmtop's limited RAM/disk resource. However, the newer 1MB units help considerably to expand the units' capabilities in this regard.

Where the 95LX really shines is in its extensive computational capabilities. The built-in Lotus 1-2-3 v2.2 is quite full-featured, and has been modified only to make better use of the smaller screen. It includes all the graphing functions, and can even be linked to the financial calculator using the "solver" function of the calculator. To those users already familiar with Lotus 1-2-3, this unit provides ample portable functionality for those people who need to take their spreadsheets with them.

The other built-in functions of the 95LX don't quite measure up to the ease-of-use and elegance of the other popular palmtop organizers, but they are quite adequate from a functional point of view. For example, use of graphics is generally nonexistent; little touches like the World Time feature which, on most other palmtops, is accompanied by an (admittedly spurious) silhouette of the continents of the world, is missing from the 95LX's no-nonsense text-only approach.

In general, this machine is designed for functionality, not for style. However, at present, the 95LX represents an excellent value for the price, and its PC compatibility gives it extra versatility. Due to its DOS compatibility, you can run DOS personal information managers (PIMs) instead of using the built-in programs. Pressure from Apple and other manufacturers who are gearing up to introduce either higher-powered or less expensive units, however, may provide interesting competition during the upcoming year.

THIRD-PARTY 95LX SUPPORT

As I mentioned before, a nascent third-party support industry has sprung up around the 95LX. Here are some of the more noteworthy options currently available:

Personalized Software, Inc. publishes a bimonthly newsletter called the *HP Palmtop Paper*, with a subscription price of $39 a year. It includes tips and tricks, advertisements for third-party accessories, and lists of 95LX-converted DOS software; every subscription includes a disk filled with compression programs, games, utilities, and Lotus 1-2-3 templates and macros.

A company called Palm Tree Products, based in Waltham, MA, distributes a number of useful accessories, including three different models of carrying cases (belt, breast pocket, and wallet-style) and other useful accessories for the HP palmtop.

Globalink, Inc., produces a line of two-way language translator cards, including Spanish/English, French/English, and German/English. These cards retail for $299. The system is capable of translating entire documents, and will give you a "bilingual interlinear file" that allows you to view each sentence

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alternately in each language, giving you the ability to edit the machine-generated translation and "clean it up." Globalink also provides translators with larger vocabularies for use with full-sized PCs.

Soft Warehouse, Inc., based in Honolulu, has produced a 95LX version of its Derive mathematics program. Derive is capable of doing 2-D and 3-D plotting and symbolic mathematics including matrix operations, algebra, and calculus. Derive for the 95LX retails for $289.

Extended Systems produces a nifty device called JetEye for $129. It allows you to print directly to any model of HP LaserJet printer via the infrared port. This eliminates the hassle of having to connect the 95LX to your PC with a serial cable. In addition, the JetEye allows for file transfer to and from your desktop PC.

Motorola's NewsStream mobile "Advanced Information Receiver" will allow your 95LX to receive information such as electronic mail, personal schedules, news, weather, traffic reports, stock market information, airline schedules, and the like. These services are not yet in place; however Motorola intends to market these information receivers for a number of palmtop computers, including the 95LX.

IntelliLink, Inc. has developed a Microsoft Windows application that eases file transfer between the 95LX and your PC. IntelliLink is HP NewWave-aware, and includes connectivity with IBM PROFS, Borland Sidekick 2.0, Microsoft Word for Windows, Microsoft Excel, AmiPro, Lotus 1-2-3, Paradox, dBASE, and other Windows 3.x built-in applications.

PAMCO produces the CD3568 Card Drive which connects to a PC parallel printer port and allows the PC to access HP 95LX PCMCIA 1.0 memory cards as though they were an external disk drive, with a data transfer rate of up to 80kbps. This allows the PC to access information on a memory card faster than is possible using the serial link.

MOBILE COMPUTING

Wouldn't it be convenient to be able to check and even send your electronic mail while you're sitting on the train, or when you're on the road, far from a phone jack? Well, the time might not be too far off.

Right now, you can use a cellular modem to connect to your favorite remote service; however the per-call charge is rather high, and there is no way for the remote machine to notify you when incoming mail has been received. New alternatives to the cellular modem, however, are just now coming to the surface. The Motorola NewsStream™ service, discussed in this and earlier columns, has the advantage of being able to use a very small, lightweight, one-way receiver. You cannot send information via this network, however.

RAM Mobile Data is a wireless data service which provides mobile computer users with two-way data transmission service, using a technique similar to a cellular phone system. However, it is designed specifically as a data packet-switching network, which means it is much better suited for data transmission than using a cellular modem. In particular, in contrast to a cellular phone, there is no significant delay waiting for a connection, and data packets can be very small, costing as little as three cents for a single packet of information.

At present, the cost for transmitting data is approximately 25¢ per 1K of data, with no extra long-distance or connect charges. This is competitive with a cellular modem for small file sizes; a large file, however, can be transferred more cost-effectively using a cellular modem. Currently, RAM Mobile Data is set up to service private companies with vertical-

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market applications, but these networks might eventually be used to provide consumer services as well. Recently, RAM Mobile Data announced the addition of TCP/IP networking support, allowing portable computers to use standard TCP/IP-based software such as FTP (a file-transfer protocol) and SMTP (a mail-transfer protocol). RAM Mobile Data is a cooperative business venture between RAM Broadcasting and BellSouth.

Ericsson GE, a division of General Electric, has begun shipments of the Mobidem portable wireless modem for use with the RAM Mobile Data Mobitex networks. The Mobidem is specifically designed for use with palmtop, notebook, and laptop computers, and will allow mobile computer users to travel around town or around the country and stay connected. Approximately the same size and shape as a small cellular phone, the Mobidem connects to your portable PC via any RS-232 compatible serial port, and will constantly scan the Mobidex network for incoming information, even when the PC it is connected to is turned off.

Mobidem modems are currently sold via a remarketing agreement with RAM Mobile Data; however, PC dealer distribution is expected to begin this fall. At present, this technology is still a bit pricey, but the existence of this product suggests that the time may not be too far off when the average consumer can expect to have mobile two-way connectivity within his/her grasp. The current retail price of the Mobidem is $1795.

MORE PCMCIA NEWS

SMART Modular Technologies has created an interesting spin on the PCMCIA memory card market; its SmartRAM memory card combines flash RAM and regular static RAM on one card. If you recall, flash RAM is used in palmtop computers to simulate a hard disk; it keeps its memory even when no power is applied. The drawback of flash RAM is that it requires a high-voltage pulse to rewrite the memory, making it unsuitable for anything but long-term storage. Static RAM, on the other hand, is used for applications that require a lot of writing as well as reading of data; however, it is more expensive and requires a small amount of power to retain its data.

The SmartRAM card combines both technologies into one card: 256K of static RAM and 768K of flash RAM. Programs and infrequently changing information can be stored in the flash RAM, whereas the static RAM can be used for information that requires a lot of writing. This can reduce the total power consumption used by the card. The suggested retail price of this card is $160 for a 1MB card. The SMART company also plans to produce a 2.76MB card and a 20MB card in the near future. ■

Where the 95LX really shines is in its extensive computational capabilities. The built-in Lotus 1-2-3 v2.2 is quite full-featured, and has been modified only to make better use of the smaller screen.

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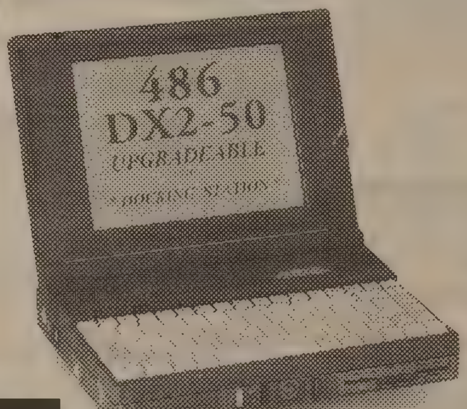

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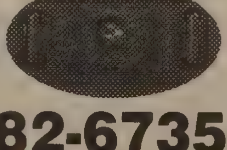

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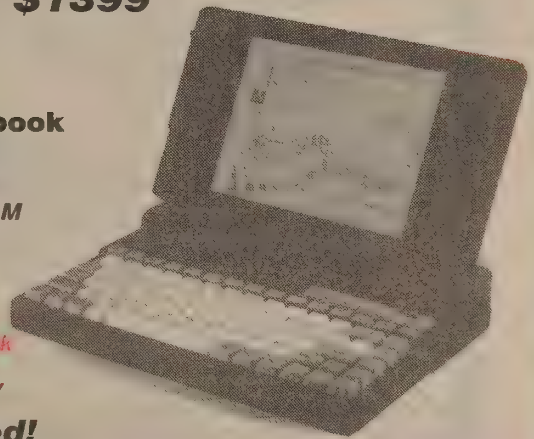

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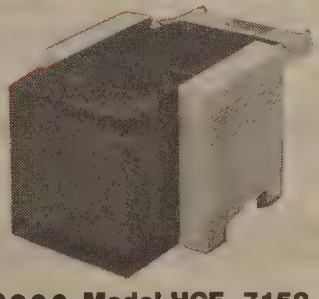

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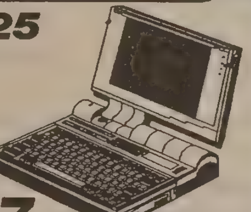

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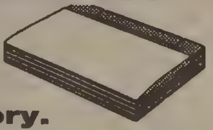

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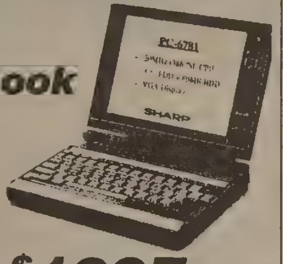

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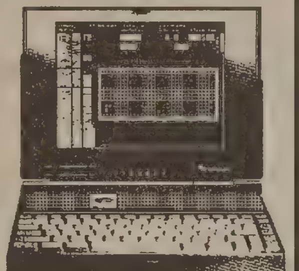

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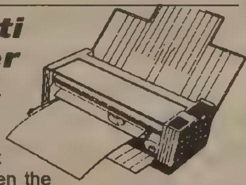

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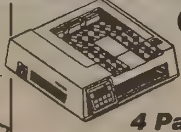

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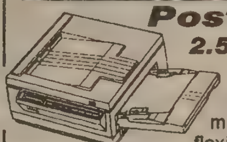

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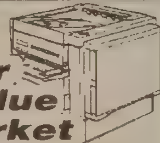

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A Hard Drive For Portables

This Portable, Battery-Operated Hard Drive Provides A Wide Range Of Uses

BY ED KAHN

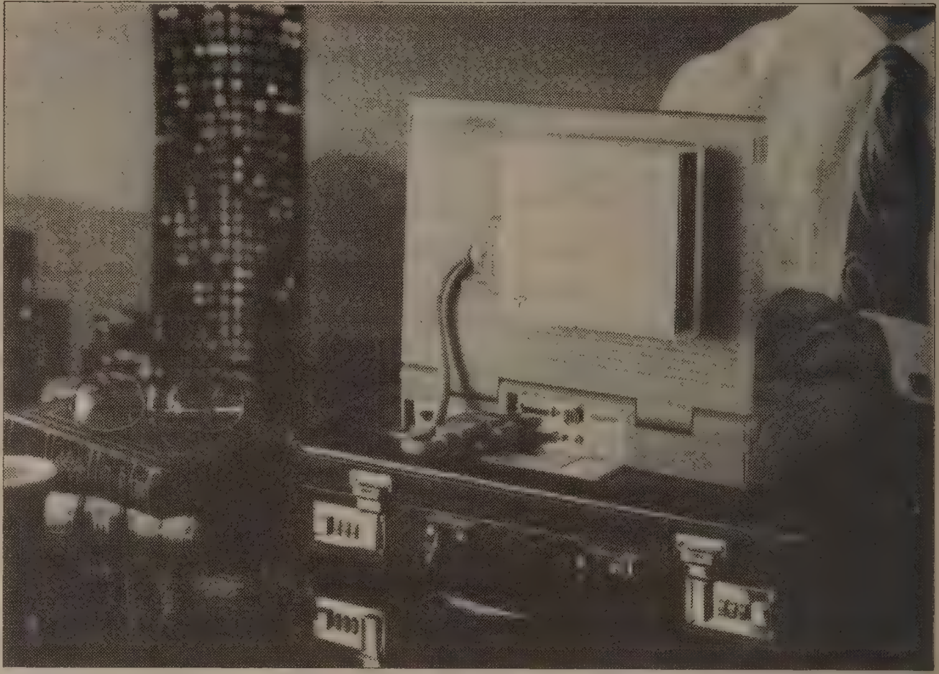
The parallel port is becoming increasingly important as a way into the inner workings of a computer. In the not-too-distant past, most devices required the addition of an expansion card—an impossible situation on most portables—or the use of the serial port. Over the past few years, more and more products have begun to utilize the power of the parallel port for getting data in and out of computers. This month, we are highlighting the Traveler-HD, a portable, battery-operated hard drive that connects through the parallel port.

The usefulness of this device is broad. Not only can you expand the capacity of an older portable that either has no hard drive or a pitifully small one, but you can use it to back up data, transport files without carrying a whole computer, and, in a corporate setting, keep test files on a portable drive that can be moved from computer to computer.

The market has been flooded with portable drives, but I chose this one to highlight because it seems particularly well suited to use with portables. First, it is small—occupying roughly the area of a 5.25" floppy disk and a little over an inch thick. I tested a 20MB drive that weighed 1 1/2 lbs. Secondly, it is battery-operated. The Traveler-HD comes with rechargeable batteries that run up to five hours without recharging. An AC adapter unit comes with the drive. If convenient, you can plug this in and never have to worry about recharging the unit again; but if your needs require true portability, then you can begin your work session with a fully charged battery and actually extend the time your portable will work without recharging.

Battery life on a portable is significantly affected by the number of times you access the hard drive. If you transfer your work files onto the Traveler-HD, you will conserve the battery power of your portable and perhaps double the time it will run before needing to be recharged.

Although the Traveler-HD works equally well on desktop machines, it is clearly designed for use with portables. This drive lets users easily transfer files between laptops and desktop machines. If you have only a few files to transfer, there are less expensive ways of doing the job, but if you have a large amount of data to carry back and forth, this may be the solution. It is a good deal easier than carrying a portable between locations.



A final application that needs highlighting is its use with some of the palmtop machines. These tiny computers typically do not provide disk storage because of their small size. This drive, however, gets around this limitation. Specific instructions are included for use with the Poqet and Atari palmtops. I did not try the hard drive with these machines, but I have no reason to doubt that it will work flawlessly with them. The installation disk has a subdirectory devoted to files for installation on the Atari Portfolio.

Installation on a laptop is as easy as the advertisements boast. You plug a cable between the computer's parallel port and the designated port on the Traveler-HD. If you are using a printer, it can be plugged into the port on the back of the portable drive. The use of the parallel port for the hard drive in no way diminishes its usefulness as a route to the printer. Both the hard drive and the printer can be used at the same time.

After making the hardware connection, you put the installation disk that comes with the package into the floppy drive and type "install." It makes a change to your config.sys file and asks you which drive you use to boot the system. Additionally, it asks you how long you want to set for the hard disk to wait before shutting down if it is not accessed. You are instructed about the options and given default values. If you do no more than hit return a couple of times, installation will be complete. When you reset the computer, the hard drive will be available. The whole job took me less than five minutes!

A set of Velcro pads lets you attach the hard drive to any surface you like. I found it convenient to set it on my desk, but if I were using it on an airplane, I would surely attach it to the top of my notebook system.

Memory Products and More, the company that markets this drive, has introduced a whole range of hard drives—from the 20MB drive that I tested, up to a 500MB drive. The largest battery-operated drive, however, is 130MB. AC-powered drives range from 80MB to 500MB and weigh 4 lbs. Prices vary accordingly. The least expensive battery-operated model sells for $340. The Traveler-AC 500MB model goes for $2299.

While these drives are not inexpensive, if they do the job you need done, they are well worth the price. Performance was flawless and this product fills a niche that is otherwise empty. ■

RESOURCES:

Traveler-HD, $340
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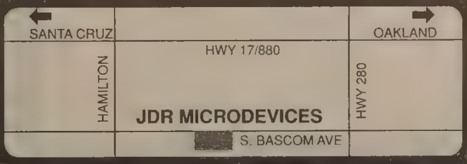

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Computer Of The Month

Gateway 2000 HandBook

In these days when computers have become commodities, it is exciting to find something really new in the marketplace. Gateway's HandBook is such a product. Although it is the first of a new category of computer—somewhere between the palmtop and the smallest notebook models—it has been anticipated since Chips and Technology first announced their 8680 PC-on-a-chip processor last year. In any case, Gateway is the first out of the gate. The new technology means that full-featured computers can now come in smaller packages. In fact, the manufacturers could actually make these models even smaller except for the need for a decent display and keyboard.

The basic configuration is an MS-DOS computer with a 40MB hard disk in a package measuring 9.8" x 5.9" x 1.4" and weighing 2 3/4 lbs. With battery pack, the weight jumps another 1 1/4 lbs. This unit will definitely fit inside your briefcase or handbag. The computer comes with 1MB of RAM, but is expandable to 3MB ($135).

While it is a full-featured computer that will run all of the standard programs you may wish to use, it is not a high-end system. No provisions are made for adding your own keyboard or a color monitor. What you see is what you get. In order to keep the weight and size down, there is no floppy drive in the unit. A Combo Unit housing a 3.5" floppy drive as well as a serial and parallel port is available for an extra $270. The computer does have both serial and parallel ports, but the parallel port is used to connect the Combo Unit. With the accessory module attached, you will have two serial ports, so you can use both a mouse and modem. If you skip the extra expense of the Combo Unit, you can transfer programs and data onto the system with the LapLink software and cable that come with the system.

This computer is designed to fill a specific niche between palmtops and laptops. It does so perfectly. The keyboard is not quite full size, but it is certainly adequate to accommodate a decent typing speed. Touch typing is not an exercise in frustration. In fact, I do not find the keyboard much more limited than most of the notebook computers I try out.

The computer comes with a rechargeable battery pack. But in a pinch you can even run the system on alkaline batteries. Either a full charge or a set of six alkalines will run for about 4 1/2 hours if you have set up the system for maximum power conservation. If you are going to use alkaline batteries, you will have to buy a battery holder ($20). An extra rechargeable battery pack goes for $70 and an extra AC adapter for charging a second rechargeable battery pack will set you back $75.

The screen measures 7.6" diagonally. While this is a bit smaller than most notebook computers, it is adequate. It is clear enough to read without eye strain and shows a full 25 rows x 80 columns, accommodating any software right out of the box. This is a big advantage over smaller computers, like the Poqet, that need specially configured software to accommodate a smaller screen. Technically, the HandBook offers CGA resolution, but it is a double scan system which means that the display is in fact 640 x 400 pixels.

The Gateway 2000 HandBook comes with a full array of software. MS-DOS 5.0 is included as well as Microsoft Works. This program is my favorite for beginners because it offers everything most users need: word processor, spreadsheet, database, and communications modules. In addition, the system comes with LapLink XL and Central Point's Desktop, a personal information manager. All of the software is installed so you can take the computer from the box and turn it on. Full documentation and distribution disks are, of course, packed with the system.

The Gateway 2000 HandBook fills a void like the sandwich and a half at the deli. When a palmtop is not enough and a notebook is too much, try the Gateway 2000 HandBook. ■

RESOURCES:

Atari Portfolio, $299.95
Atari Computer Corp.
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North Sioux City, SD 57049-2000
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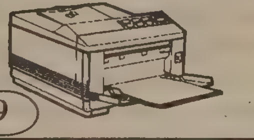

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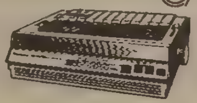

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Clone Dealers Offer Benefits To Value-Added Resellers

Clone Dealers Are Specializing To Offer VARs Better Quality, Availability, Service And Prices

BY MARV DOWNEY

The precipitous drops in PC hardware prices is causing some PC buyers to reevaluate their purchasing decisions. People who might have otherwise opted for a no-name or off-brand clone can now find top name brands for as little as 10% more. But the primary question to consider, as always, is value.

"Value-added" is a phrase that has been loosely applied to several aspects of PC sales. The intent is to identify a sales outlet that packages general PCs with specific hardware, software, and/or services. These add-on's make the PC instantly more valuable to the customer (or at least make the customer believe this is the case).

VALUE-ADDED DEALERS AND RESLLERS

In the early years of PCs, there were only general computer dealers. Everyone sold a little bit of just about everything available. But many dealers soon realized that the growing universe of PC products and the business problems to which they were being applied were too much to keep up with. Specialization became necessary to do a good job of selling and supporting PCs. This spawned the growth of those know as VADs, value-added dealers or distributors, and VARs, value-added resellers.

As managers of sales outlets explored ways to add value, some specialized in specific manufacturers' products. These products might be applicable to a number of different types of businesses, but were complex enough to require specialists. A good example is networks. You will rarely find a VAR with the technical expertise to adequately support both Novell NetWare and Banyan Vines networks.

Others specialized in application categories, like CAD (computer-aided design) and DTP (desktop publishing), involving products from different manufacturers. The systems assembled from these products can be sold to different types of businesses. CAD systems, for instance, are used by architects, engineers, and space planners; and desktop publishing by authors, advertising agencies, and educational institutions. It is the knowledge of both the tools and techniques to achieve the desired results that differentiates VARs in this category.

Still others specialized in applying general PC products to the problems of specific types of businesses. Lawyers, doctors, small manufacturers, and retailers now can all choose from among several VARs that focus on knowing in detail how their particular business works. These VARs then package systems that solve the unique problems such businesses face.

VALUE-ADDED CLONE MANUFACTURER'S

This trend towards specialization has not gone unnoticed by PC manufacturers. All of the big name PC builders have tried to develop ways to sell their products through VARs, with varying degrees of success. VARs are usually small and order products one, two, or five at a time, as opposed to the orders for hundreds or thousands of units from the large retail computer dealers.

This was the doorway through which some clone computer manufacturers entered the PC industry. VARs who found the resale requirements of firms like IBM and Compaq too stringent began basing their PC solutions on readily available low cost clones. The maturing clone market can almost always provide much better price/performance than comparable brand name products. But the real issues for the VAR are quality, availability, and service. It is these clone builders who provide all three that have become known as "value-added clone" companies, or VACs.

WHAT VACS CAN OFFER: A CASE STUDY

Kangaroo Technologies of South San Francisco opened its doors in early 1984, assembling high performance hard disk and tape subsystems for IBM-compatible PCs in early 1984, selling mostly to European clients. When these clients started asking for low cost alternatives to IBM and Compaq computers, Kangaroo began building clones in 1985. Their business is currently split almost evenly between domestic and overseas sales. About 85% of their domestic sales are to VARs. The only end user sales they do are in bid situations where a dealer or VAR markup would price their systems out of contention, or in areas where they have no established reseller.

Company president Gary Kench believes sales through VARs create a better climate for success. "We can concentrate on building and servicing the computers, without having to worry about showing someone how to format a disk or load their programs," he says. "End users need someone to help with those things, but it's not the role of the manufacturer."

This is one of the major differences between a VAC and a storefront clone builder. Retail operations that build their own PCs must respond to a much wider range of user questions and problems, or risk gaining a reputation for poor service. The VAC shifts responsibility for that support to the VAR.

Quality and wide product availability is another major difference. Jerry Crawford is the principal consultant for VitalTech, a South Bay VAR specializing in Novell networks and law offices. He has used Kangaroo computers both for his clients and in his role as a beta test site for vendors like Microsoft, Quarterdeck, and network hardware vendors. "Even though the parts used by different clone builders are functionally equivalent, I've found a tremendous difference in quality with Kangaroo," he says. "Other clone builders I've used weren't as careful in the assembly process and tried to be too cheap in the components they selected."

Michael Price of Michael Price Associates in Menlo Park agrees. They are one of the Peninsula's few Novell Gold network VARs, specializing in LAN installations of Microsoft Windows. He uses both Kangaroo and Everex computer systems for his clients. "Kangaroo is always our first choice for a number of reasons," he says. "They will build systems for us using parts—main boards, hard disks, etc.—that we specify. This allows us to stick with things we know to work well, both in general and specifically with Novell. But they also stay very current on components and make suggestions for new parts. And they build things

RESOURCES:

Kangaroo Technologies Corp.
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Marv Downey, founder and owner of Market Value Systems, a Value-Added Reseller (VAR) organizations specializing in real estate appraisal computer sales, consultation, and training. Market Value Systems, 1328 6th St., Berkeley, CA 94710. (510)526-7766.

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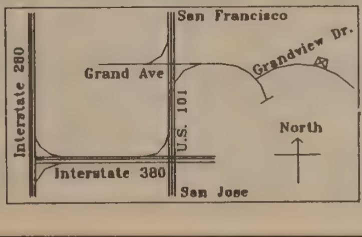

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well. We have problems with fewer than 5% of their systems, a level very few clone builders could ever hope to achieve."

VALUE-ADDED CAN MEAN EXPENSIVE CLONES

Kangaroo, their VARs, and their end users concede that customers pay more for (VAC) systems than they would for the least expensive clones. They all believe that this is where the word "value" plays a major role.

As VitalTech's Crawford says, "The 5%–15% premium I pay for their systems is absolutely justified by the quality and support I get. Most of the time, if a part does fail, they will cross-ship a replacement (they send out a replacement part before receiving the failed one). They have always taken the attitude that the most important thing is to get the system running again as quickly as possible, and everything else comes later. A lot of clone builders will send failed parts back to the original manufacturer and make you wait until they get them back. Or they try to blame computer problems on software or add-on hardware." Price agrees. "Their prices are a bit higher, but their quality and responsiveness makes it well worth it."

The other part of the price equation is the clone dealer paying more, up front, for higher-quality parts. Keith Bui, Kangaroo's general manager, says that they usually pay anywhere from 10%–15% more than rock-bottom prices for many of the parts they use to ensure the quality of the finished system. "Some parts, like IDE controllers, can be up to 33% more expensive for better quality," he says. "Some of the cheapest components we've tried in the past can have warranty failure rates of over 50%. By comparison, our best quality components have warranty failure rates of less than 5%. Many of them also have two year warranties."

PARTS AND SERVICE

Quality varies not just in how reliable the system is, but also how well it does the job. For example, Bui says he sees wide differences among VGA boards. "Two boards may use the exact same VGA chipset, but the additional components and the board itself are not the same quality," he says. "You can see a difference in the image using the two boards on the same monitor. Hard disk performance can also vary dramatically between two drives with the same average track-to-track access speed when one includes a RAM buffer on the drive electronics and one doesn't." These are the details that really add value to the PC.

Michael Price stresses the advantage in using a "true" clone. "Most of the name brand vendors, like Dell, AST, IBM, and Compaq, rely heavily on proprietary parts—power supplies, main boards, video, etc. As a network vendor, we have to be able to get our clients' systems running again immediately. We've always had problems with the availability of custom parts. We use Everex when a client demands a name brand system, mostly because they are one of the few remaining manufacturers building systems that can use generic clone parts."

Price also cites that the on-site service included with some of these proprietary systems is rarely as useful as advertised. "The third party organizations used by manufacturers like Everex or Dell frequently have high turnover and technicians with little training or experience. They seldom understand anything about network installations. We feel our clients are best served by service from us or the manufacturer, and we can offer both with Kangaroo."

Most VARs agree that the PC price wars will continue and that many current vendors won't survive. But they all believe that there is a much higher likelihood of long term survival for VACs, like Kangaroo and clone dealers, that offer a strong blend of low prices, high quality, and excellent service. ■

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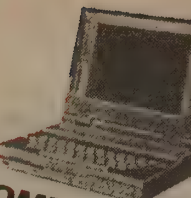

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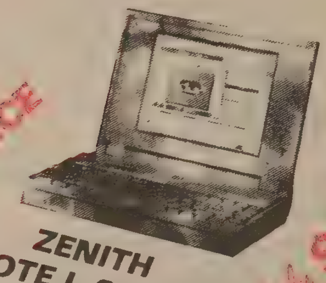

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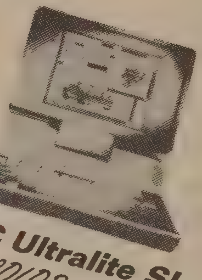

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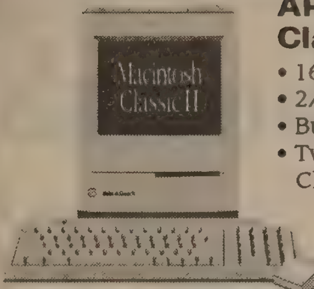

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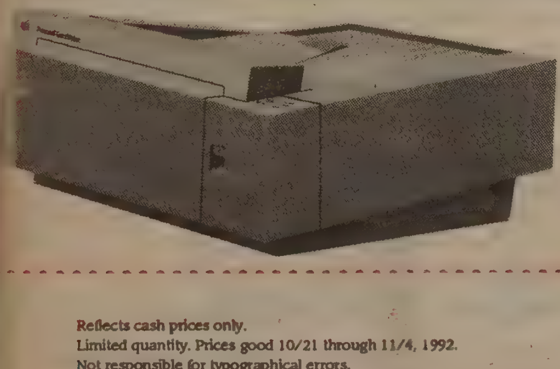

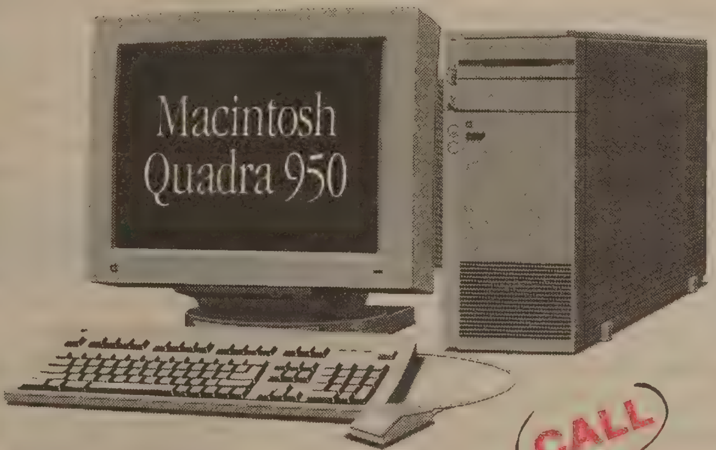

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PC World said "...the LX-29000 delivers graphics quickly, finishing first on our PageMaker and Excel tests."

Publish magazine said "Not only does this direct-mail printer carry the smallest price tag of the six printers we tested, but we found that it prints the cleanest text as well as sharp, smooth graphics."

MicroTimes said "...(If you are) searching for a 'faster! better! cheaper!' laser printer...examine this printer"

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QMS-PS 410	Canon	NO	YES	YES	NO	$1,480	$485
HP IIIp w/Postscript	Canon	NO	NO	YES	NO	$1,589	$594
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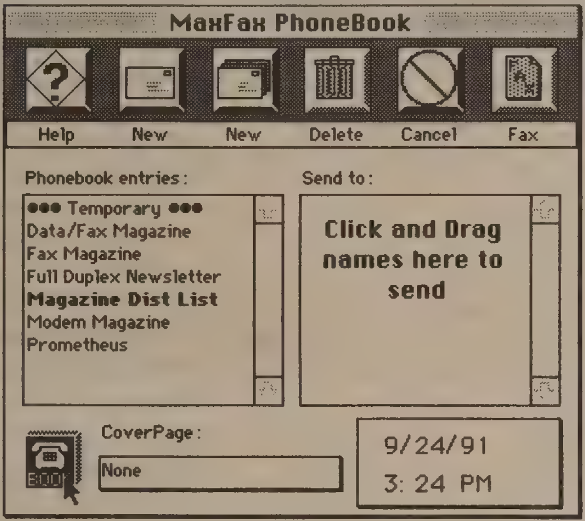
Ultima Home Office—The Ultimate (Almost) Small Office Manager

Prometheus Bundles A Fast Modem, A Fax Machine And Voice Mail In One Low-Cost Package

BY LEEANN NELSON

In 1991 the number of people working from their homes grew 12%—bringing their total to a quarter of the nation's work force. And that trend continues in 1992 as recession-related layoffs swell the ranks of the self-employed. The home business boom, in the face of a recession has benefited from the availability of newer, smarter and cheaper technology.



Phonebook entries:
- ●●● Temporary ●●●
- Data/Fax Magazine
- Fax Magazine
- Full Duplex Newsletter
- **Magazine Dist List**
- Modem Magazine
- Prometheus

Send to:
Click and Drag names here to send

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The Phone Book makes it easy to customize and address outgoing faxes.

The Ultima Home Office for the Macintosh, by Prometheus Products, is a perfect example; it bundles a high-speed modem with fax and voice mail capabilities for a street price under $500. Compare that to buying a modem, dedicated fax, phone answering machine, *and* the switcher you'd need to hook them all up to a single phone line and you've got the makings of a business-case that has small business operators everywhere reaching for their checkbooks.

I was just establishing my free-lance graphic design business last summer, agonizing over the confusing world of fax machines and getting ready to bite the bullet and install a second phone line when Ultima Home Office was introduced. One hardware and one software upgrade later, my initial enthusiasm has cooled somewhat, but I'm still amazed at just what this modem-sized box can do, and how much product you get for the price.

SEND/RECEIVE FAX

The fax/voice module of the Ultima Home Office uses MaxFax Software and includes an init that makes it easy to send faxes from any application by adding a Fax menu on the menu bar. However, the init usually gets stuck in the page set-up menu. Until this bug is corrected in a future upgrade, the solution is to go through the application's page set-up screen, holding the option key when you select Fax. That trick takes you directly to the print screen, which looks much like your application's print screen but with fax choices including quality, greyscale/color or black and white, and whether you want to send your fax now or append it to an existing fax file.

If you've got too many inits already cluttering your system, you can forgo the MaxFax Init and send faxes by choosing pMaxFax through the Chooser—just as you would to switch printers.

After making your selections in the print screen, the application goes to the MaxFax PhoneBook. With your clients and customers contact information stored here, a simple click-and-drag addresses your outgoing fax. It's easy to add names to the phonebook manually, or you can import any comma-delimited or tab-delimited text file. You can also create multiple phonebooks for ease of use, and export text phonebook files for use in other applications.

At the PhoneBook screen you can also select a cover page—several "canned" options are included or you can design your own—and add a personal message.

Once you click the Fax button MaxFax will begin converting your document to fax format. This can be a slow process, especially if you have complex graphics in your file. It completely bogged down trying to image Quark Xpress documents containing color pict files, and files using the CoolBlends Xtension.

The conversion process can take place in the background if you're running System 7, or Multifinder under System 6 with background printing turned on.

Receiving faxes can also happen completely in the background, although you do lose control of your Mac briefly as the modem answers the phone. To view a received fax you have to launch the MaxFax application, choose it from your fax log and choose open or print. You can also convert fax files to PICT, TIFF or MacPaint format to use in graphic applications.

The Ultima Home Office determines if an incoming call is a fax or a voice call by listening for the CNG tone generated by most fax machines. Since not all fax machines generate this tone, there is a way for the caller to force MaxFax to answer a fax call by pushing a pre-set code on the phone keypad. However, I ran into some trouble receiving faxes from an older fax machine using this method.

Fax files can be large, and are stored hidden away in a MaxFax Files folder in the system folder, so you have to be sure to keep outdated files deleted through the Schedule Queue.

MESSAGE ANSWERING

This is the feature that really adds the value to this box—that makes it more than just a fax/modem—and it's pretty slick. You can have up to 999 private mailboxes, each with an individual outgoing message. You can remotely retrieve and delete messages, and even re-record your outgoing messages from a remote phone. And there are plenty of other bells and whistles like a toll-saving "additional rings if no messages" feature, a customizable silence time-out setting, and the ability to limit the length of messages by individual mailbox.

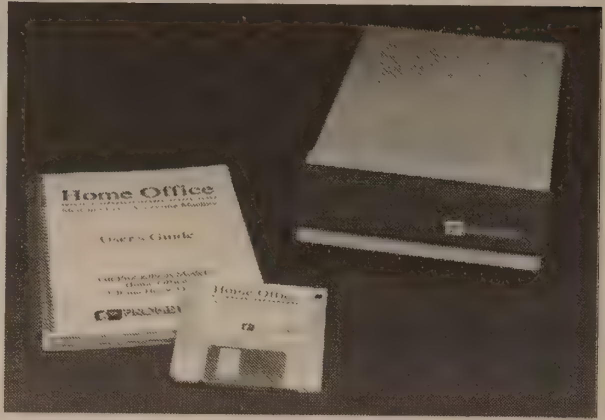
It's easy to set up and style to your liking, and it's fun to use. But there are a few drawbacks. Voice messaging takes control of your Mac during the entire process of recording a message, unlike the fax module that gives it back to you once the connection is made. This is a hassle if you're not answering the phone because you're trying to get some work done on your computer.

Also unlike the fax module, the MaxFax software must be open to receive messages. This means running Multifinder under System 6, and constantly giving up some operating RAM to an application running in the background. I also didn't like the idea of leav-

RESOURCES:

Ultima Home Office, $649
Prometheus Products, Inc.
9524 SW Tualatin Sherwood Rd.,
Tualatin, OR 97062
(503)692-9600
1-800-477-3473
Fax: (503)691-1101

LeeAnn Nelson owns Nelson Design, a graphic design firm in San Ramon, California specializing in publication design, advertising, catalogs, logos, and corporate identity. You can reach her Ultima Home Office voice mail at (510)837-2445, but if it's busy or her drive's too full to record your message try (510)837-8531.



Prometheus Products' Ultima Home Office looks like a standard external modem—but with send/receive fax and voice mail capabilities it delivers a lot more.

ing my computer on all the time just to catch those after-hours messages. (I solved that problem with the $75 PowerKey and QuicKeys Lite to power up and shut down my Mac automatically.)

And, on several occasions my Ultima simply wouldn't answer the phone at all. But the biggest challenge is disk space. Sound files are big! You can figure a one minute message recorded under the "Good" option will average 156K, while "Better" and "Best" options will average 216K and 300K. Multiply that by your 999 outgoing messages, and a few long-winded incoming messages and that 1GB hard drive looms as a real necessity.

If your drive gets too full, the automated attendant calmly informs your caller that his message cannot be recorded. I know this because I heard the message when I called the vice president of marketing for Prometheus, but couldn't leave a message because his system was too full.

SPEEDY MODEM

Prometheus has a long history in modems and this is a great one. The high speed V.32bis modem can send up to 14.4Kbps and includes V.42bis automatic error correction and data compression for throughput up to 57.6Kbps. In other words, it's really fast—I mean really fast. And, it connects automatically at the other modems' highest speed, from 300bps to 14.4Kbps.

The telecommunications software that's part of the bundle is MAcKNOWLEDGE, which I found to be powerful and a bit more intuitive than MicroPhone, although I had problems with some of the scripts provided to automatically connect to online services. A handy feature is the "Lookup Table" that helps you find local numbers for all the major online services at various connect rates. Of course you don't have to use Prometheus' proprietary software, any telecommunications software will work with the modem, but as part of the package it adds even more value to an already great deal.

And it is a great deal when you can get a speedy modem with good telecommunications software, a fax machine and voice mail for the price of the Ultima Home Office. But I ended up adding a second phone line anyway. If you spend much time online, or transmitting files, or even sending faxes, you'll lose a lot of phone calls to a busy signal.

But mostly, I just wish I could add more room to my 130MB hard drive. The MaxFax and MAcKNOWLEDGE software take about 2MB, and storing faxes and voice messages eats up space faster than a hungry dog eats Milk Bones. MaxFax also requires at least 2MB RAM and System 6.0.7 or later.

The Prometheus Ultima Home Office is a good, solid package at a very reasonable price. But with the existing bugs, and the limitations of having your computer serving several different functions while you try to get some real work done, it's not yet quite the "ultimate" office machine. ■

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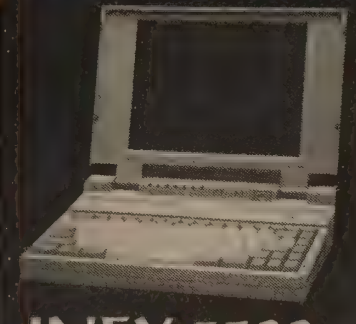

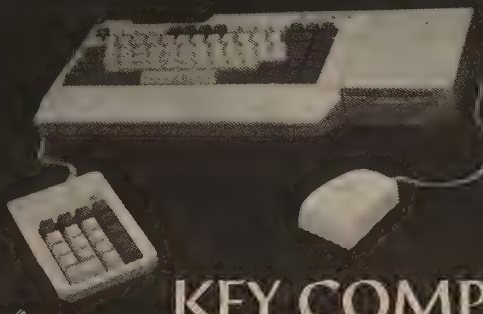

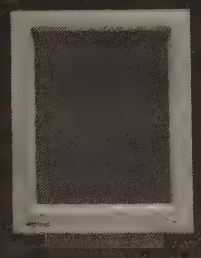

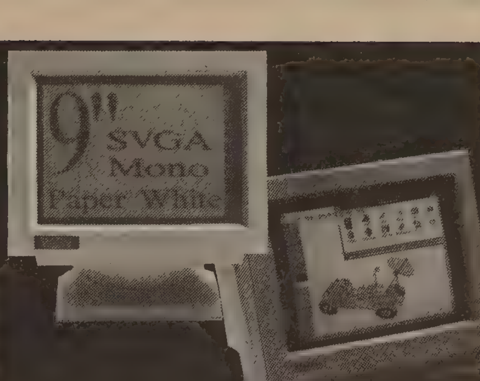

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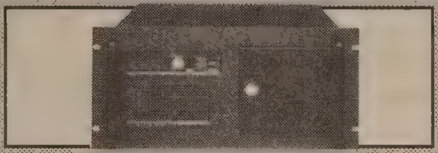

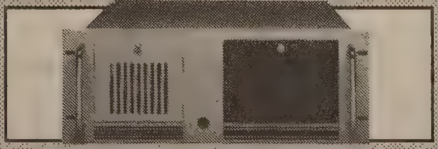

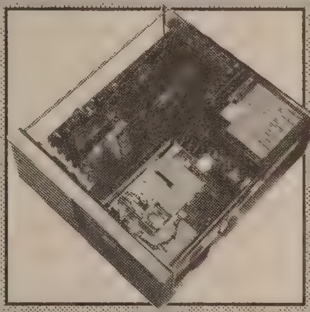

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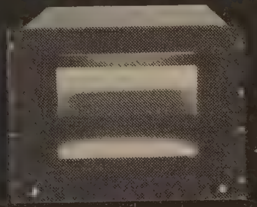

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How Managers Can Successfully Supervise Telecommuters

Techniques To Help Managers Implement A Telecommute Policy And Maintain The Company's Productivity

BY ROBERT MOSKOWITZ

Some of the loudest objections to introducing telecommuting into an organization are the mid-level managers' complaints about the potential problems such a policy will create. When managers cannot see employees busy at their desks they often become uncomfortable. Many managers react badly when they realize they cannot call impromptu meetings or drop in for a chat with a certain employee at any old time. Some fear problem employees will malinger when not in the office, while others worry about the added administrative burden of managing this new breed of telecommuting employee.

Each of these complaints is a clue to serious problem areas that a successful telecommuting program must address and overcome. But while the picture looks bleak from a theoretical point of view, actual experience demonstrates that all of these potential problems—and many others—can be prevented from causing a breakdown in the company's production, service, and profitability.

Here are some ideas and techniques that managers have found to be effective in making sure that a new telecommuting program does not disrupt established company operations or productivity patterns.

TO MANAGE WORKERS WHO "AREN'T THERE"

Some managers have grown used to seeing ranks of desk chairs occupied by warm bodies, and enjoy equating this sight with a productive employee team. But even for the best managers, there may be little if any correlation between the presence of a warm body and that body's production of useful work. The most effective managers tend to supervise their employees not by chaining them to their desks, but by getting them to accept fair work goals and then by evaluating each employees' actual results against the agreed-upon goals.

One of the hidden benefits of telecommuting is that this "management-by-objectives" style works very well not only for employees who telecommute one or more days per week, but also for employees who work full-time in the office.

The best managers' approach is to schedule a regular series of individual meetings with each employee—perhaps weekly, monthly, or quarterly—and agree on an itemized set of goals for the coming period. If employees work in teams, it's often possible to hold one meeting with an entire team and develop goals for everyone at once. Effective managers know that these goals should be expressed in writing and signed by all parties.

For employees who do data entry or word processing, managers can easily set quantitative goals for the days they work at home. But most employees do at least some work that requires qualitative assessment and evaluation. Here the savvy manager must work with the employee to get agreement on exactly what final product the company requires, when it is needed, and how it will be measured. Managers new to "management-by-objectives" often make the mistake of unilaterally imposing a set of goals on each employee. But experience shows that employees are far more enthusiastic about and committed to meeting goals which they have helped set—even when these goals are more demanding.

At the conclusion of each evaluation period, there's another meeting. The twin topics of discussion are how well the employee (or team) met the goals for the previous period, and what the new goals for the coming period ought to be.

But the best managers recognize that telecommuters may require some interim meetings to discuss progress, problems, and anticipated completion dates. Depending on circumstances, they may check with a particular employee once a month, or even every week or two, reviewing preliminary work and sometimes even lending a hand with a difficult aspect of a project. They recognize that staying closely involved improves the telecommuter's chances of completing the project satisfactorily and on time.

TO AVOID WORRIES

Another dimension of managing telecommuters successfully is identifying those best suited for the new arrangement. Many employees don't need close supervision to meet—or beat—their work goals. In even the best managed offices, however, there may be one or more employees the manager cannot comfortably trust to work hard without immediate, "hands-on" supervision.

To solve this problem, it's easy—and advisable—for the organization to set up a telecommuting program in which certain employees are not likely to become eligible. A common rule is to require the manager's approval before an employee qualifies for telecommuting. This also has unintended good results, because the desire to begin telecommuting sometimes prompts a problem employee to make a serious effort toward becoming more productive and reliable.

Managers can learn to select the right employees for telecommuting programs by considering a variety of factors.

WHAT DOES THE EMPLOYEE DO?

Before approving anyone for a telecommuting program, good managers tend to look at the employee's job responsibilities and analyze how much of this can be done away from the office. Responsibilities that are inappropriate for telecommuting include those that involve:

- meeting the public (receptionists)
- using equipment available only in the office (switchboard and other machine operators)
- supporting other employees who need immediate response (secretaries)
- working with confidential information that cannot leave the office.

A few employees do exclusively this kind of work. But most positions involve work that can be done perfectly well outside the office, such as:

- thinking, reading, analysis, writing or editing, or similar work with images and graphics, with computer programming, engineering, architecture, and so forth
- contact work with customers, suppliers, and in-house departments for purposes of planning, coordination, expediting, problem solving, and so forth.

A good manager can reorganize a position for an employee who wants to telecommute so that work can be bunched to allow at least one day per week away from the office.

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Robert Moskowitz is a business consultant based in Woodland Hills, CA, who writes frequently on productivity, office automation and technology.

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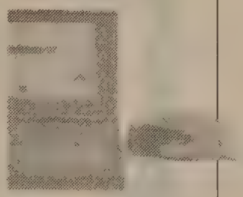

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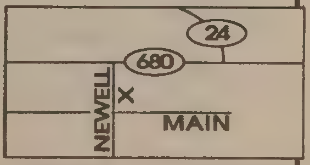


WHAT KIND OF EMPLOYEE IS THIS?

A second factor that good managers consider before approving an employee for a telecommuting program is their personality, character, work habits, and record on the job.

Experienced managers recognize that working at home successfully requires self-discipline and a desire to perform well on the job. It may also require a measure of self-sufficiency, because those who telecommute are going to be more isolated from their co-workers than those who continue to come to the office every day.

TO REIN IN A TELECOMMUTER WHO ISN'T PRODUCING

Although managers often fear that most telecommuters won't work out well, it's only a few employees who seem never to adapt to this new way of working. To deal with this danger, managers in the best telecommuting programs consider participation to be an option and a privilege, not a requirement. This allows leeway so employees who fail to adjust well or experience insurmountable problems with telecommuting can be brought back into the office full-time.

As soon as a telecommuter begins missing his or her performance objectives, it's appropriate for his or her immediate supervisor to open a discussion about the reasons for the unsatisfactory situation. Sometimes, helping the employee with additional training or to develop a better work environment outside the office will greatly boost the lagging productivity. Other times, there's just a mismatch between the employee and the requirements for successful telecommuting. Rather than reflecting poorly on the manager, this situation can prove a manager's skill, particularly if he or she is quick to identify and remedy the situation. Such experiences also help build his or her competence to manage all employees more successfully.

TO IMPROVE A TELECOMMUTER'S LEVEL OF OUTPUT

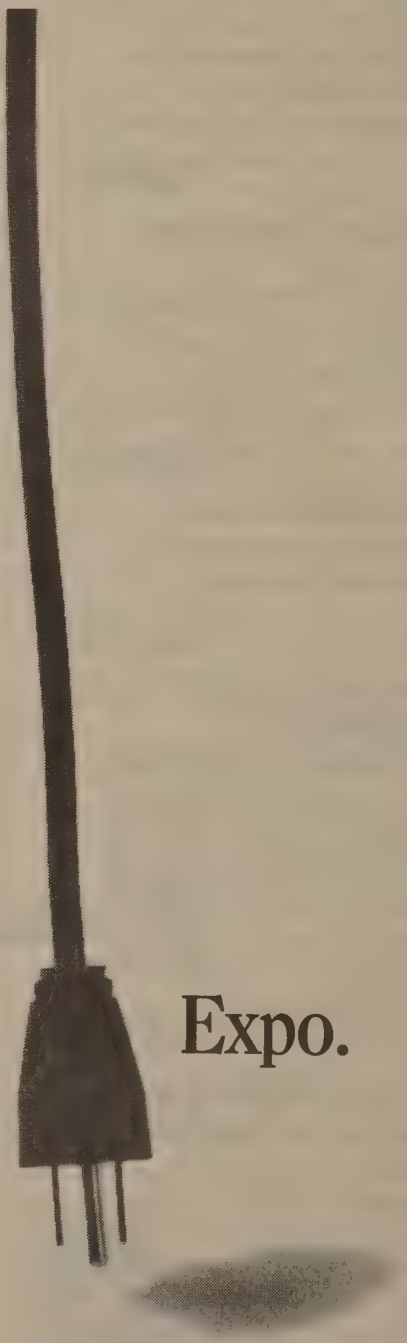
A good manager can also look into the reasons a previously successful employee has productivity problems when telecommuting. Often a frank discussion can pinpoint the problem and offer a viable remedy. For example, some of the most common reasons a telecommuter's work suffers stem from a failure to establish a solid "work environment" comparable to the one at the regular office. This environment should include:

- adhering to specific work times and break times during the day
- adhering to standards for attire and behavior. If at home, these can obviously be somewhat more relaxed than those for the office
- a good setting for doing the work. If at home, it should be separated from living areas and distractions like kitchens and TV sets
- sufficient resources and tools needed to accomplish the work.

TO MAINTAIN GOOD COORDINATION AND TEAMWORK

A good manager will also oversee the level of contact between telecommuters and others in the office. Telecommuters may require a certain level of contact to accomplish their work goals away from the office. This can be accomplished with regular access by telephone, by frequent meetings which telecommuters attend via the speakerphone, and by adding technology such as voice mail and computer networks. Those who need to contact the telecommuter should have a

Continued on page 282



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Computerized Accounting For Homeowner Associations

Affordable And Easy-To-Use Accounting Software Is Closing In On The Paperwork Necessary To Manage A Homeowners' Association

BY DAVID SIMON, CPA, AND JENNIFER ROBIN CHERNISS

The growth in condominium housing has spawned hundreds of thousands of homeowners' associations of all sizes. Homeowners' associations are saddled with burdensome but necessary paperwork and administrative details associated with their operations. Wherever there is burdensome detail, computer software will be close behind.

Homeowners' associations are responsible for maintenance of a development's common area, and are empowered to collect funds from members necessary to perform these functions.

The financial transactions of these associations, even the larger entities, may be quite limited—they assess the members, collect user fees, and then pay the bills. Often the largest line item expenditures are for utilities, repairs, maintenance, and for the manager, if there is one. Many associations are small, consisting of only a dozen or fewer units, and have no outside manager. This article will focus primarily on the needs of associations that either self-manage or hire limited managerial services.

Despite the apparent simplicity, accounting requirements for homeowners' associations can be numerous. The budget must include estimated revenue and expenses on an accrual basis. There are disclosure requirements for the amount of cash reserves available for repair or replacement of common facilities, and other reserve fund reporting requirements. A balance sheet and an operating statement need to be prepared. If the association has gross income of at least $75,000 in any year, the financial statements need to be reviewed by a certified public accountant, a procedure which is basically a scaled down audit.

Many smaller community associations rely on "pass the hat" accounting—rotating the bookkeeping and other responsibilities among the members. The aim of this system is to assure that everyone is treated equally and no single person gets stuck with all the work. It generally keeps everyone happy, except perhaps the accountant who has to sort out the records for tax filing and reporting purposes. Other associations may rely upon whoever is most available and willing to do the bookkeeping.

In a typical case, Karl came to my office recently. He is this year's bookkeeper for his fifteen-unit Oaky Hills homeowners' association; he sells medical equipment in his day job. Karl brought a checkbook register and bank statements for the past year and asked for annual financial reports. He also had some pages set up to track everyone's monthly dues payments, with comments penciled in to show how much was paid for late charges and fines. Every year another Oaky Pines resident/owner was responsible for writing the checks and keeping track of things. Some people were neater than others, but in every case the papers were brought to me in pretty raw form, requiring me to review the basic bookkeeping, reconcile the bank accounts, and figure out what was missing from where.

The accountant's time (read: the homeowners' association's bill) could be saved if even the simplest accounting software were used. Not only would my job be made easier, but the association or board members would have instant access, in an organized form, to information it needs from time to time.

Unlike accounting software, neither a database nor spreadsheet is self-balancing—they don't make debits equal credits.

A simple check writing package, for example, will not only generate a check, it will code it to the appropriate account, track payments to that vendor on a year-to-date basis and, perhaps, keep track of payables.

SOFTWARE FOR FUND ACCOUNTING

Most homeowners' associations follow the generally accepted accounting standard of reporting to their members on a fund accounting basis, as opposed to the profit and loss financial accounting of for-profit business corporations. Examples of other entities subject to fund accounting include governmental agencies such as sewer districts.

While fund accounting software is readily available for these organizatins, I generally do not recommend using this software for a homeowners' association. These packages tend to be sophisticated, specialized, expensive (typically from over a thousand to many thousands of dollars), and difficult to learn, requiring a specially trained operator. Because of the limited market for fund accounting software, these packages lack many of the easy user interface features that have become standard on most popular programs.

In most cases, I would rather use personal or small business accounting software. Low-end packages for this purpose, all available for under $300, include DacEasy, Quicken (by Intuit), Peachtree, AccPac, ProfitWise (by Solomon), One Right Plus, and many more.

NON-ACCOUNTING PACKAGES

In some cases, the members are a bit more sophisticated than Karl's group, and they keep all the transactions organized on a spreadsheet or database package.

Howard, a computer operator for a direct mail firm, did accounting for his homeowners' association. He set up the books on dBASE because he works with dBASE all the time, finds it comfortable, and already had the package at home. He set up fields for account

Continued on page 226

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David Simon, CPA (M.S., Taxation), is in tax and accounting practice in Oakland. His clients include a variety of professionals and businesses. He can be reached at (510)893-5753. Jennifer Robin Cherniss is a free-lance writer living in Berkeley.

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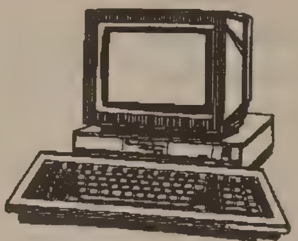

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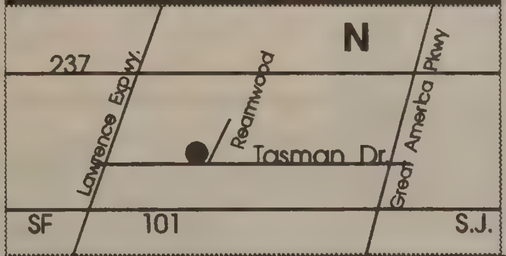

Groupware For All Occasions

Collaborative Computing Across A Wide Range Of Applications

BY YACCO

LOCAL AREA NETWORKS

After the Seybold publishing conference in 1990, I wrote a column about the lack of workgroup support for desktop publishing. Two years later, at last month's Seybold conference at Moscone, Quark previewed a system built on Quark XPress that incorporates key workgroup features.

The Quark Publishing System (QPS) adds Quark CopyDesk and Quark Dispatch to Quark XPress. The system lets writers, editors, artists, production, ad departments, and others collaborate on the design and content of a publication.

CopyDesk is the word processor that allows you to work within QuarkXPress. Unlike some other systems, you edit right in the layout with CopyDesk. Dispatch serves as the administrator and controls workflow between the participants. A managing editor can use this system to monitor progress, assign tasks (stories, ads, etc.), and embed notes. The embedded notes appear highlighted on top of the copy like an electronic Post-It note, and serve as email to others in the group. If the editor cuts or rearranges text, the writer can go back into the document and see the changes, together with the editor's comments or further instructions.

QPS for the Mac is expected to ship in early '93, and should include ten copies of CopyDesk (it supports a maximum of twenty-two connections), and the Dispatch server and administration tools. Dispatch is designed to support its own XTensions, and some will probably be included in the package as well. The system is tentatively priced at $17,880—not including the required multipack of QuarkXPress licenses. (The Windows version of QuarkXPress itself is to ship on October 19th, so QPS for Windows will not appear until sometime after the Mac edition.)

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It's interesting to note that the Seybold publishing conference is now simply called Seybold San Francisco—change which reflects a broadened scope and includes more forms of communication. Consider also that connectivity and groupware are two sides of the same coin. Communication links provide the infrastructure that enables groupware. The availability of groupware provides incentive for still more links.

The trend toward groupware is clearly going to continue. The stuff is starting to appear for more and more applications as vendors add the ability to interact and cooperate to their existing products. Capabilities can include messaging, scheduling, or some other form of coordinating communication like the sophisticated workflow controls that Office.IQ (covered here last month) and QPS have.

In fact, the field is already getting so crowded that another work-routing product called Dispatch is on the boards. This one, an add-on for the sophisticated Higgins email and scheduling system, is expected to be introduced at Networld in Dallas. It will automatically route any piece of work as an email enclosure.

But this seemingly simple evolution can hide a dangerous pitfall for the unwary: the lack of organizational commitment. Groupware can call for far more involvement, and at a higher level in the company, than other software. The range of organizational demands will vary with the implementation: the structure it imposes, the degree of cooperation it requires, and its susceptibility to sabotage from withheld participation.

LOW-END INFO-SHARING

Simple email falls at the low end of organizational demand. Other groupware applications, which seem to have entered the market by merely adding file locking, may require more coordination. Info Select, for example, is a cardfile database that's always been marketed as an easy-to-use personal information manager (PIM). The groupware version adds file locking and the ability to handle a second type of card stack, the network stack, in addition to private stacks.

Basically, Info Select is a flat-file database—either standalone or terminate-and-stay-resident (TSR)—built on a cardfile metaphor. It's similar to the Windows Cardfile accessory, but with many differences. For instance, it automatically shrinks cards to exactly fit their text, and it tiles as many odd-sized cards as fit the screen. It isn't limited to free-form text either: a forms feature lets you define fields. It also includes several sorting strategies, interapplication cut-and-paste, a mail-merge facility, and the ability to bubble more important cards to the top of the stack. It performs Boolean, date-range, and duplicate searches, as well as a "neural search" that finds cards that best fit a list of criteria by using fuzzy logic. Like the Cardfile dialer, its dialer automatically finds phone numbers, but in addition, the tap of an arrow key automatically gets the next number. The program's Overview command lets you instantly build a summary containing every line with a key string—say, a certain date.

> **Lotus Notes requires administration, management support, and cooperation from a quorum of participants before it can succeed. Lotus realizes this, and that's as big a part of the reason you can't buy it off the shelf as the installation requirements.**

Info Select's salient groupware feature is the network stack used to share information. File locking allows anyone with access to modify these stacks. It's easy to assign one or more to each user's email for example.

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methodologies. However, Notes makes sense only in the context of the individual business's work practices and procedures. Although the product comes with a set of fifty predefined applications, and all the development tools used to build them, every customer is potentially different, and each requires a custom installation.

"Very often when people bring Notes in with a particular task in mind," says Notes Product Manager Cindy Schuyler, "they find that it can be used to support any number of group activities." Its ability to support almost anything places a heavy demand on support services. "Its installation is further complicated by a networked environment that requires an OS/2 server," she says.

But another key factor in the Notes strategy is building user commitment. The Notes target market is a department with particular tasks that must be accomplished by people working together. From the beginning, Lotus knew that even a superior groupware product could fail on the job without a quorum of participants. Thus, for the first two years or so, Notes was sold only direct, and only in volumes that justified the necessary support (at least 200 licenses). Today, VARs and IBM also sell Notes to smaller installations, but always with the pre- and post-sales support that ensures both a proper installation and a proper attitude. The day when Notes will be sold over-the-counter still awaits a foundation of technical training materials, motivational training, and other programs to supplant this big-league support, as well as a more sophisticated market place.

Notes requires administration, management support, and cooperation from a quorum of participants before it can succeed. Lotus realizes this, and that's as big a part of the reason you can't buy it off the shelf as the installation requirements—in fact, bigger.

DIFFERENT JOBS, DIFFERENT TOOLS

Not every application demands this high level of committment. QPS is designed for a workgroup application where participants traditionally cooperate, and where a managing editor helps enforce the process. Info Select is useful for simple email and individual Rolodex applications with minimal group coordination. The degree of cooperation required from participants is further reduced by Info Select's file-locking mechanism. It frees resources according to a selectable timeout, or when the user changes stacks, hot-keys out (TSR), or quits Info Select.

However, although each of these applications requires different levels of commitment, none is totally free of the requirement. While QPS serves a natural group application, it could still be limited by reluctant participants. If advertising drags its feet, editorial has its hands tied (and its metaphors mixed). Routing work with Higgins must presume that the recipients will look in their mailboxes. Even a basic product like Info Select has the potential to do more given the right level of support and coordination.

Like groups themselves, groupware is a political animal. If you're installing groupware, or your groupware isn't performing up to expectations, ask yourself if you've really got the kind of backing you need from management. Get your executives committed—and have them communicate their commitment throughout the organization—and any groupware will work better. ■

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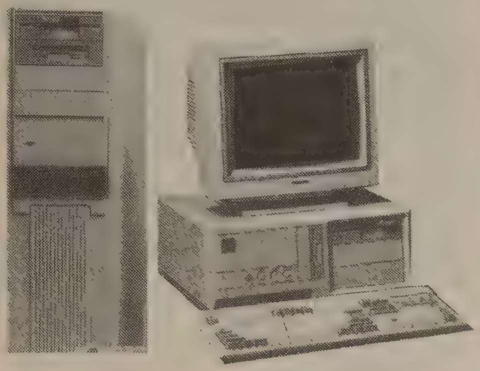

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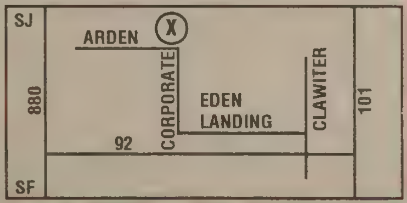

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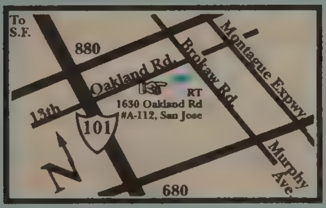

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Software Package Eases Pain Of Creating Job Descriptions

Comprehensive Job Descriptions Are One Of The Most Important Steps In The Recruitment Process

BY CHRISTINE SODERBERG

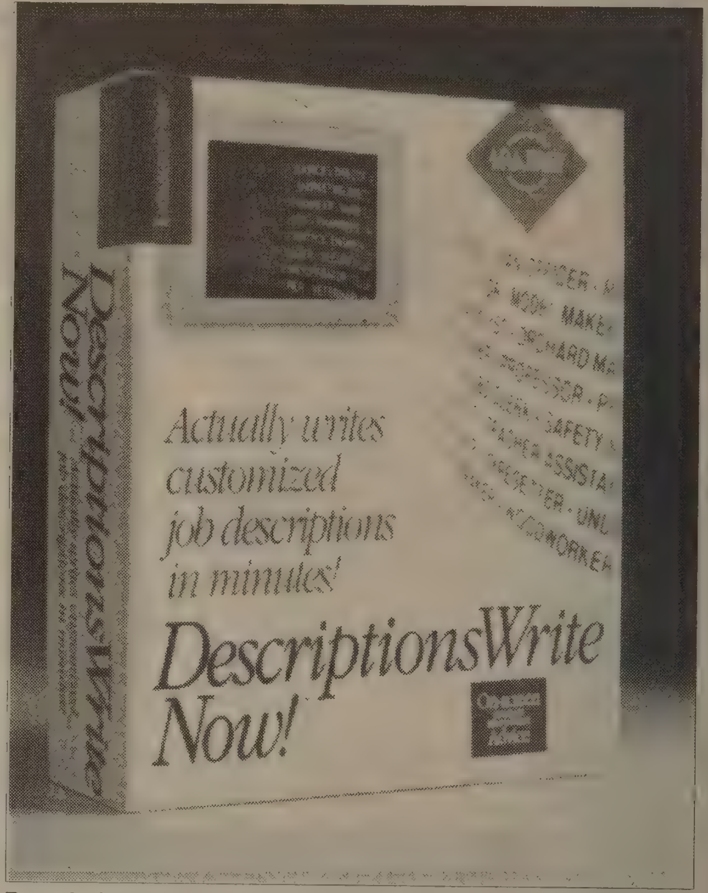
Nothing is more expensive than a wrong hiring decision. It is not the cost of the search or the lost salary but the cost of lost opportunities. Businesses of any size can ill afford to have development or marketing delayed because the wrong person was hired.

What steps can busy executives take to help ensure they are hiring the best candidate? One of the most important steps in the recruitment process is the creation of a comprehensive job description, according to Mel Connet, managing principal for the software industry group of Korn Ferry, International.

Job descriptions today are more difficult to create than ever before, Connet said. For those with little experience, writing job descriptions can be a daunting task. In addition to including the standard information about a position, today's job descriptions must be able to stand up to increasing government regulation and employee litigation, making them extremely complicated to develop. "I have seen hundreds of job descriptions that not only would not stand up to legal scrutiny, but also do not include some of the most essential elements of a position description such as reporting relationships, the number of employees the candidate will manage, or compensation levels and benefits."

Connet believes that DescriptionsWrite Now!, a PC-based software package that writes customized job descriptions, can help managers and business owners create position descriptions that are so thorough they will facilitate every phase of employment, from recruitment to performance reviews. "DescriptionsWrite Now! is the first product I have seen that meets, in an effective and cost-effective manner, the age old need of procedures, policies, and documentation that well-run companies need," Connet stated.

DescriptionsWrite Now! offers practical advice and guides the user through every step of the creative process, providing context-sensitive human resources information and program help. The software provides the ability to locate and merge language to clearly describe essential duties for any job. The question-and-answer process custom-writes legally appropriate language for a position's supervisory responsibilities, qualifications, physical demands, and work environment. This feature enables the employer to clearly communicate the skills and abilities necessary for successful performance in a particular job. This information also helps business owners comply with the Americans With Disabilities Act (ADA) and other employment laws.



DescriptionsWrite Now! custom-writes job descriptions by guiding the user through a step-by-step, question-and-answer process.

Under the ADA, managers must base their employment decisions on the applicant or employee's ability to perform the job's essential duties. Written job descriptions can be a critical piece of evidence in both justifying and defending employment decisions if a discrimination complaint is filed, explained Jamerson Allen, an attorney with Jackson, Kewis, Schnitzler, and Krupman, specialists in labor and employment on behalf of management.

"Further, because ADA requires an employer to reasonably accommodate an employee to allow that person to perform the essential job functions, written job descriptions serve as a tool to help employers and supervisors in the day-to-day operation of the business by stating the essential functions of the position," Jamerson noted.

Dave Klick, executive vice president of the North Western Food Processors Association, has a background in human resources. As a result, he boasts extensive experience in writing job descriptions and is familiar with the stress and confusion that can accompany their creation. Managers often don't know

Continued on page 288

DescriptionsWrite Now! offers practical advice and guides the user through every step of the creative process, providing context-sensitive human resources information and program help.

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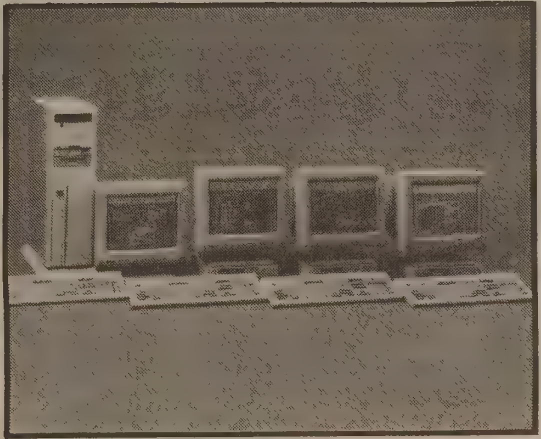
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Perl, Revisited

Beyond Shell Scripts With The Gurus

BY BENNETT FALK

UNIX

Earlier this year, there appeared in this space a brief introduction to perl, the Practical Extraction and Reporting Language. Perl is a glorious amalgamation (some might say hodgepodge) of features from sed, awk, C, and the various UNIX shells. Its name implies that perl is a language for manipulating data to produce reports of various kinds; in fact, perl is a more generally useful programming tool than its name suggests, and has found considerable favor among system administrators.

At the time, two things were clear: perl was a tool with a lot of potential, but it would also be difficult to learn how to use perl systematically. Working with perl is more a matter of having to achieve something (preferably under duress) and scrambling through the documentation to figure out how to get things done.

It was in this spirit, when the requisite conditions were achieved last month, that the gurus decided to have a programming contest.

The occasion for the contest was a project awarded to the gurus to create an "installation manager," a piece of software to manage third-party software installations. The project's only restrictions were that the tool had to be capable of organizing software provided by a number of different vendors, and it had to be easy to maintain.

With their customary disregard for deadlines, the gurus first procrastinated and then, on the Friday afternoon before their Monday deadline, repented of their procrastination and set to work. With very little time and no formal specification, the gurus decided to break up into teams and build prototypes illustrating typical features of the target program.

One team built its prototype relying on shell scripts, the other team used perl. One feature of both prototypes was a routine to run an application program and check for any errors that occurred during the program's run. Figure 1 shows a fragment of the shell script that implemented this feature. Figure 2 shows the perl script that performs the same function.

Copyright © 1992 by Bennett Falk. All rights reserved. Bennett Falk lives in the Bay Area, writes when he can, and hopes for the best. He works for Sybase, but the opinions and attitudes expressed are his own.

The shell script team knew what it was doing and finished its fragment in about fifteen minutes. The members of the perl team had never worked with perl before and put on an elaborate show of scratching their heads and rustling manual pages. They finished the fragment shown in about thirty minutes, and evoked some disdain from their colleagues for taking so long and having so much fun.

The shell script approach to this portion of the installation manager attempted to execute application programs and redirect each program's output (both standard output and error output) to another file. After a program finished running, the installation manager checked its logfile for errors, using the grep command to search the output file for messages indicating success or failure.

The gurus looked at this fragment and nodded. The techniques involved were fairly standard for shell programming. The gurus admired the use of the "2>&1" construction, which is the shell's mechanism for merging standard error and standard output. Some regretted that a separate "grep" command was needed for each pattern of interest in the output, but after all, grep can't be made to match multiple patterns in a single command line. Some thought that perhaps awk would be preferable to grep in this case.

The shell script team was thanked for doing a creditable job quickly, but some of the gurus shifted in their seats uneasily. In the shell script approach, the check for errors came only after the application had finished. The shell script could distinguish between non-fatal, fatal, and more serious errors, but it would only respond to these errors after the program was finished. It seemed to have no way of interacting with the program as errors occurred.

BETTER LIVING THROUGH PERL

The perl team explained their fragment in considerable detail. After printing out a message describing what product will be started, the perl script used an "open" call to create a pipe from the designated command:

```
(open(EXEC, “application_program 2>&1 |”)
|| die “Could not start application program\n”);
```

The gurus were impressed: the "open" and "close" calls are usually used to manipulate files, but perl allows the substitution of a command in place of a file. The open call takes two arguments, a file handle (or logical name) to identify the file for reading or writing inside the perl script ("EXEC" in this case), and a physical name that tells perl what operating system file to associate with the specified file handle.

If a command line is used in place of a physical file name, it must signify whether the command is being "opened" for reading or for writing. This is done by adding a pipe sign ("|") to the command line. If the pipe sign is the first character of the command being opened, the command will be executed and its input will be piped to it from the perl script. If the pipe sign is the last character of the command line, perl will read output from the command.

The shell script could distinguish between non-fatal, fatal, and more serious errors, but it would only respond to these errors after the program was finished. It seemed to have no way of interacting with the program as errors occurred.

The command line for the perl script was

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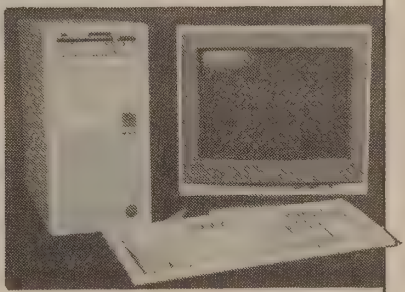

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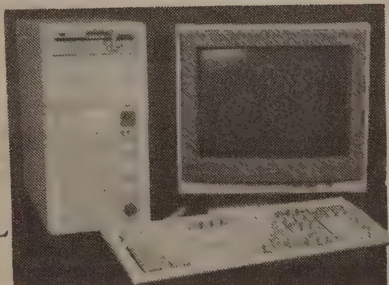

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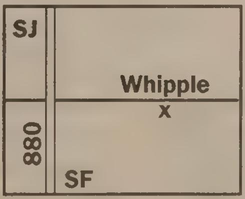

essentially the same as the command line for the shell version. As with the shell version, standard output and standard error were merged. The only difference was that the perl script did not send the merged output stream to a file. Members of the perl team pointed out that, depending on the program to be monitored, it was sometimes advantageous to put the program in the background (by adding an ampersand to the command line just inside the pipe sign).

The gurus noted two interesting features of the use of the open call in the perl fragment. When "open" is used to create a pipe, the named command is run in a child process, and open returns the process id of this child. The perl team's program saved this process id in a variable ($appl) for use later. (In this case, the "kill" command would be used to signal the process to stop when certain kinds of errors were reported.) This fragment would also detect the failure of the "open" call and exit ("die") with a message indicating what failed.

Once the application program had successfully been opened, the perl script would read and evaluate output from the command in a "while" loop. The construction

```
while (<EXEC>) { ... }
```

directs perl to take its input from the named file handle (EXEC), and to execute the commands between the curly brackets for each line that is read. The "while" loop will terminate when the attempt to read from EXEC returns "end of file" or when a "last" command is encountered among the commands executed.

The commands inside the "while" loop, the gurus were told, illustrate perl's pattern matching capacity. Each line read from the EXEC file handle is evaluated in a series of "if-else" statements, each statement looking for a different indicator of success or failure. Reports of success or non-fatal errors are passed to the user, but no action is taken. The report of a fatal error triggers an attempt to stop the application with a kill command; a report that the application "bombed" causes the installation manager to exit.

When the perl team finished its explanation, the gurus sat back. After a few moments of silence, they began to debate, and the only real question was whether they'd get more time to play with perl by first knocking out a shell script version of the installation manager. ■

Figure 1:

A fragment of a shell script to start a program, log its output to a file, and then search the file for errors:

```
  echo "Starting application_program."

  application_program > application_log 2>&1
  Status = $?
  if [ $Status -eq 1]
  then
     echo "Could not start application_program."
     exit 1
  fi

  grep -i "fatal error" application_log > /dev/null 2>&1
  Status=$?
  if [ $Status -eq 0 ]
  then
     echo "application_program stopped after fatal error.\n"
  fi

  grep -i "non-fatal error" application_log > /dev/null 2>&1
  Status=$?
  if [ $Status -eq 0 ]
  then
     echo "application_program had non-fatal error.\n"
  fi

  grep -i "bombed" application_log > /dev/null 2>&1
  Status=$?
  if [ $Status -eq 0 ]
  then
     echo "application_program bombed."
     echo "Installation manager exiting."
     exit 1
  fi

  grep -i "succeeded" application_log > /dev/null 2>&1
  Status=$?
  if [ $Status -eq 0 ]
  then
     echo "application_program reports success."
  fi
```

Figure 2.

A fragment of a perl script to start a program, log its output to a file, and then search the file for errors:

```
  print "Starting application_program.\n";

  $appl =
     (open(EXEC, "application_program 2>&1 |")
        || die "Could not start application program\n");
  while (<EXEC>)
  {
     if (/success/)
     {
        print "application_program succeeded.\n";
     }
     elseif (/non-fatal errors/)
     {
        print "application_program had non-fatal error.\n";
     }
     elseif (/fatal error/)
     {
        print "application_program stopped after fatal error.\n";
        kill 9, $appl;
        last;
     }
     elseif (/bombed/)
     {
        die "Installation manager exiting.\n";
     }
     else
     {
        next;
     }
  }
  close(EXEC);
```

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Very Remote Remote Access

From Patagonia To The Himalayas To Kenya Or Even Wyoming, Remote Distances Pose No Barriers For The Shiva LanRover/L

BY RICH GRACE

The AppleTalk network installed last year throughout your offices helps ensure smooth and efficient communications between everyone in the company. But what about the representatives scattered across the world? Those reps, who use Macintosh PowerBooks for their work, need regular access to computing resources at the home office. Having tried several approaches, you're still having difficulties getting field reps and executives linked together into the systems at the home office. Dedicated line services are too expensive, and phone calls from Africa and Latin America are prohibitively expensive, making standard modem and dial-up communications impractical. Furthermore, Macintosh software network dial-up solutions have not been much help. What's a high-tech LAN manager to do?

THE CHALLENGE

Consider the case of the National Outdoor Leadership School. NOLS, a unique and challenging company, was confronted by just such a situation. The Outdoor School teaches people how to be self-reliant in the wilderness—to live in the wild places safely, comfortably, and successfully. The catalog itself can leave readers filled with amazement and wonder. For example, NOLS offers a 35-day Himalayan mountain climbing course, a month-long kayaking and wilderness survival course in Alaska, a 75-day semester in Patagonia exploring fjords, mountain peaks, and deserts, and a two-month exploration course in Kenya, Africa. NOLS has field representatives on four continents, in India, Kenya, Chile, Mexico, and of course North America. All of them must be linked to the home office in Lander, Wyoming, while maintaining minimal cost, high efficiency, and a sensible array of features.

THE CHALLENGE FINALLY MET

Shiva Corporation's LanRover/L is a hardware Remote Access server that supports AppleTalk Remote Access dial-in software; software bundled with every PowerBook computer. Any Mac user on the home network can also dial out using LanRover/L to other remote services, such as bulletin boards, information services, and even other networks. LanRover/L can be managed over the network, and is the first dedicated hardware solution for remote access available on the Macintosh platform. All other previous remote access solutions were software-only, which added to the processor overhead of the server, and as often as not imposed unpleasant obstacles to efficient networking.

Patrick Clark, Information Systems Manager for the Outdoor School, has found LanRover/L to be the first realistic solution to the problems he faced in tying remote personnel to the home office. Because of the features LanRover/L offers to the Mac networker, remote access capabilities have been greatly enhanced, and with Shiva's dedicated hardware solution, greatly stabilized.

"I was having difficulty with a particular problem," says Clark. "When the AppleTalk software was running in the background for remote access, every now and then we'd have an attempt to dial in and the system wouldn't answer—remote access wouldn't connect. We found on many occasions that memory had been fragmented, and Remote Access couldn't pop to the front as the main task. We'd have to call-in, ask them to restart the server in order to get the connection to work. That was a nuisance, so when we heard that someone was going to implement a remote access stack on a chip, it was exactly what we wanted. That's specifically why I bought the Shiva product. Remote access has worked much more smoothly since then."

LanRover/L supports a single user at a time (using a single AppleTalk port and a single serial port, with a modem), thus limiting additional network traffic while providing the remote link users so vitally need. "The Remote Access can't add more than one more user to the system at a time, so network overhead is not an issue. Usually sessions last no more than half an hour, such as personal business transactions or server-to-server transactions across the network," Clark adds. "That type of transaction is usually a mail server loading mail across to another server—basically just exchanging email. That way we cut down on our dial-up time. One of the reasons we went with remote access is that we have a very far-flung organization, yet we don't have the traffic that would justify installing dedicated services. We're trying to maximize the efficiency of each connection and minimize connection time, thus cutting down on our phone costs." NOLS also uses another key feature of LanRover/L, shared modem dial-out, in which several nodes can share a single modem for dial-out.

WHO NEEDS REMOTE ACCESS?

In NOLS, who makes greatest use of Remote Access? According to Clark, "When we dial-up, it's usually someone in management who has the need, such as a director who has the responsibility for operations from all over the world. He may need to come back for information that's stored on the network, or he's dropping off critical documentation and messages to the home office, and the traffic is time-sensitive or it's of importance that he dial in quickly and efficiently. In other words, it's usually company officers and high-ranking reps who need Remote Access most frequently. Ordinary business doesn't have the same priority and calls can be made at any time."

Under normal company operations, electronic communications offer a significant advantage over standard phone or fax methods. "In our business, time zones matter," said Clark. "Kenya is ten hours

Continued on page 284

LanRover/L is the first dedicated hardware solution for remove access on the Macintosh.

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Rich Grace is a free-lance and technical writer, and an enthusiastic user of PC, Mac, and Amiga platforms. He lives in Orange County. He can be reached on MCI Mail ID 484-6217.

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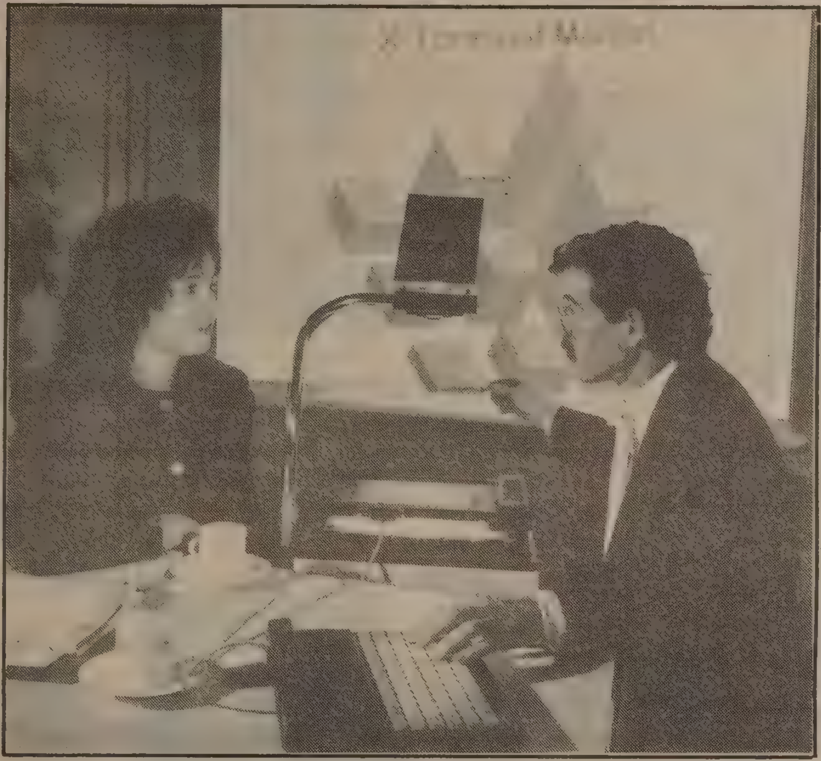

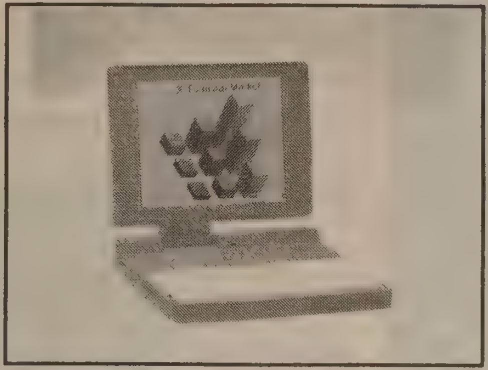

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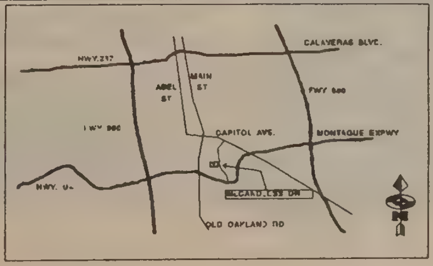

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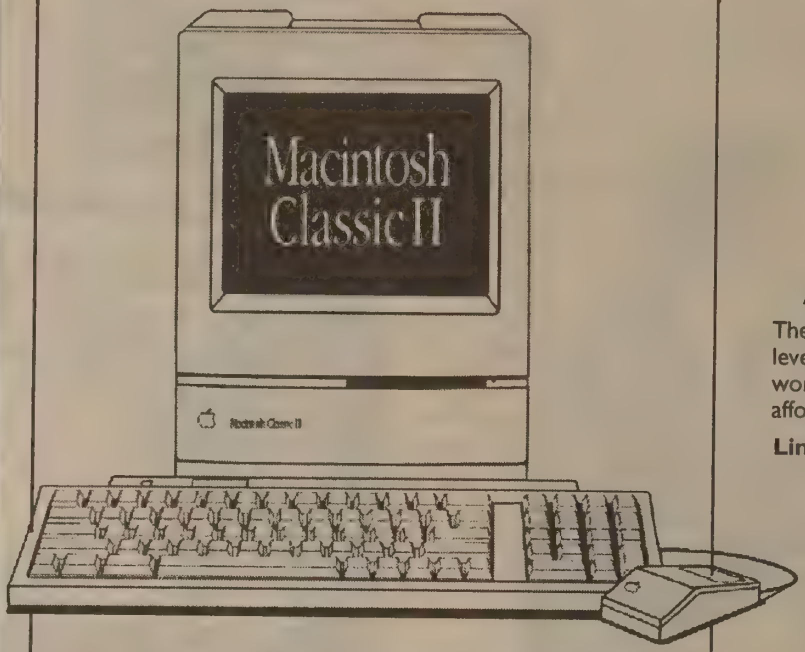

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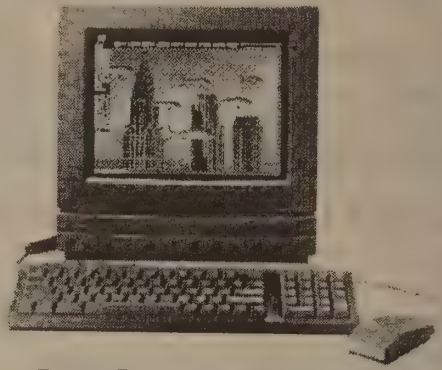

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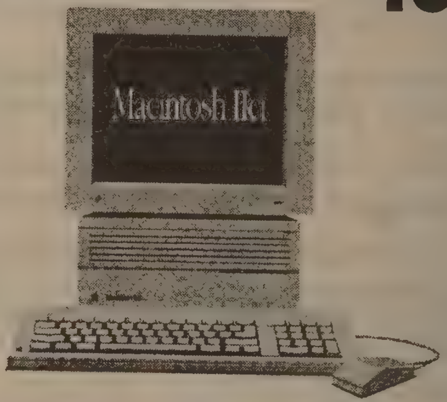

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The IIci gives you power with room to grow, including built-in flexible video support and an optional cache card for increased performance. Businesses will love its number-crunching speed; creative types will appreciate the way it juggles color graphics. 5 MB RAM. *Monitor and keyboard extra.* **$2099.**

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Errors subject to correction. Prices subject to change without notice.

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Zero%
Financing
6 Months
FOR 6 MONTHS

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WHOLE EARTH

knows Apple® Macintosh® this well.

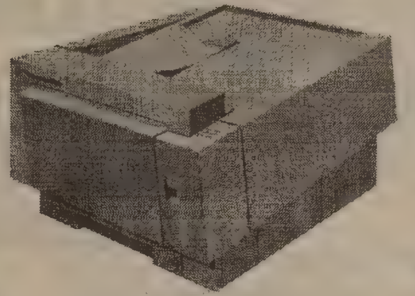
2

LIMITED SUPPLY

Apple® StyleWriter®

The Stylewriter gives you outstanding laser-like quality results for only a fraction of the cost of a laser printer.
It's now 3 times faster than before, and comes with 39 fonts. Compatible with all Macintosh® computers.

$299.



Apple® Personal LaserWriter® NTR

Whether you use Apple Macintosh® computers, Windows PCs, or both in combination, the NTR will pump your text out fast and make your art look gorgeous with a modern RISC controller and advanced page-description language.

$1679.

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Hours:
Sat-Wed: 10am-6pm • Thurs & Fri: 10am-8pm

San Francisco
Hours:
Sat-Wed: 10am-6pm • Thurs & Fri 10am-8pm

Concord
Hours:
Mon-Fri: 10am-6pm • Sat & Sun 10am-6pm

San Mateo
Hours:
Mon-Fri: 10am-9pm • Sat: 10am-6pm • Sun 11am-6pm

San Jose
Hours:
Mon-Fri: 10am-9pm • Sat & Sun: 10am-6pm

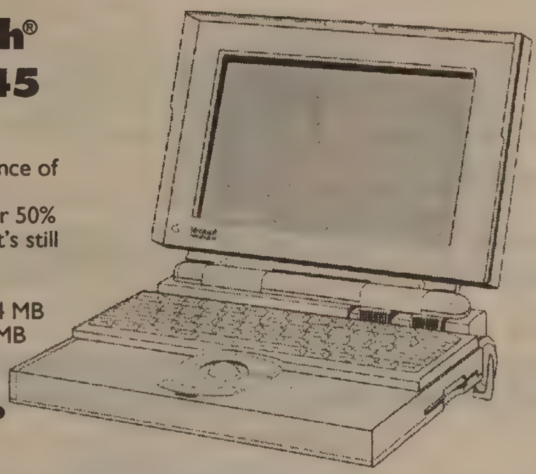
Sacramento
Hours:
Mon-Fri: 10am-9pm • Sat & Sun: 10am-6pm

NEW!

Apple® Macintosh® Powerbook™ 145 4/40

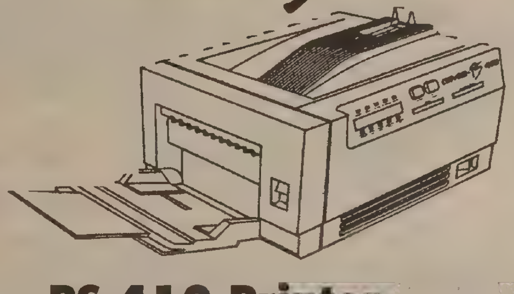
Apple took the ease and convenience of the PowerBook and added a new processor that makes the 145 over 50% faster than the PowerBook 140. It's still fully Macintosh-compatible and connectable, with the famous PowerBook ergonomic trackball, 4 MB RAM (expandable to 8), and a 40 MB hard drive.

$1999.



The PowerBook 145 is a new product in highdemand and supplies are limited.

QMS-PS 410

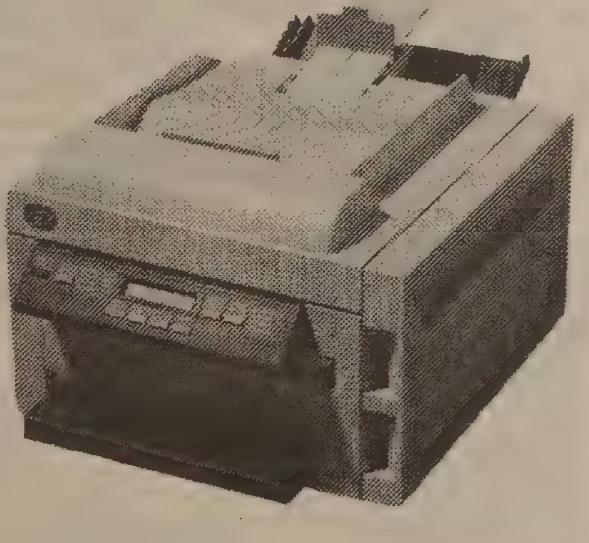


PS 410 Printer

4 page-per-minute PostScript® printer with all the most requested features at an affordable price. True Adobe PostScript, with 45 resident fonts and ATM technology built-in for sharp text, it works with IBM and Apple® Macintosh® computers, 16 MHz 68020 processor.

IBM® Laser Printer 6A and 10A

IBM Printers
LEXMARK Authorized Dealer



A is for Apple,® and nobody beats IBM for affordable high-resolution output from your Apple Macintosh® personal computer. Check out these solid features: bi-directional AppleTalk, true Adobe PostScript, small footprint, superior paper handling, contrast and darkness controls, built-in text smoothing. Plus, the 10-page-per-minute 10A comes standard with 600 DPI resolution! (The 6-page-per-minute 6A easily upgrades to 600 DPI.)

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ELECTRONICS

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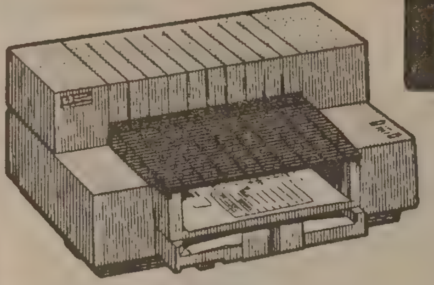
Zero% Financing 6 Months

3

THE ONLY PLACE ON Earth TO BUY COMPUTERS

Only One Place On Earth Gives You

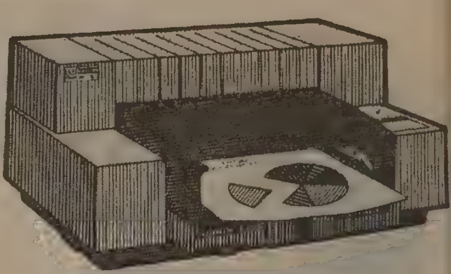
HEWLETT PACKARD



DESKWRITER DELIRIUM! $50 MFGS. REBATE See Store for Details

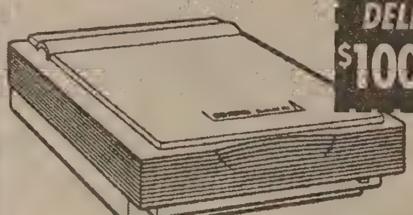
HP Deskwriter Printer

Don't settle for less than perfect, professional-looking documents. The Deskwriter prints at a smooth 300 dpi, it's affordable, and it's compatible with AppleTalk® for use with your Apple® Macintosh® personal computer.



HP DeskWriter C Printer

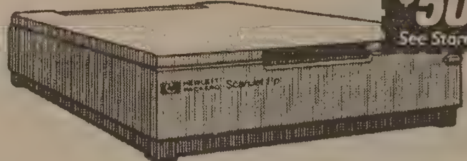
The new HP DeskWriter C adds color capacity to an already famous laser quality black output. It's compatible with Apple® Macintosh® personal computers—and your budget.



DESKWRITER DELIRIUM! $100 MFGS. REBATE for Details

HP ScanJet IIc Scanner

The new HP ScanJet IIc gives you 256 levels of gray or 24-bit color professional quality documents. Supports IBM-compatible PC's and the Apple® Macintosh®. Includes interface.



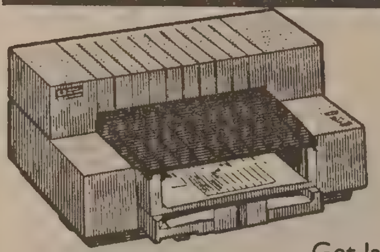
DESKWRITER DELIRIUM! $50 MFGS. REBATE See Store for Details

HP ScanJet IIP Scanner

Scan images at 300 dpi resolution, or scan text using OCR software and stop typing it in. Exceptionally easy to use; works with most popular scanner software packages.

*** Scanner rebates on Macintosh versions only.*

IF YOU'RE NOT SATISFIED FOR ANY REASON, PLEASE LET US KNOW.



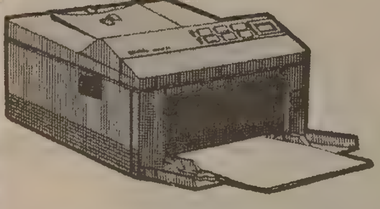
HP DeskJet 500 Printer

Get laser-sharp printing from all your DOS and Windows applications at a dot-matrix price. This instant classic inkjet printer from HP works with TrueType or font-scaling software to give you perfect type at any size. **$399.**

HP DeskJet 500C Printer

Get 300 dpi laser-quality color printing on plain paper and transparencies, for persuasive design and presentation power at a fraction of the cost of a color laser printer. Supports all major software including Windows; 3-year limited warranty.

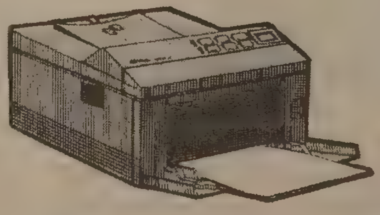
$549.



HP LaserJet IIP Printer

Another Whole Earth exclusive, this compact 4-page-per-minute printer fits easily on your desk—and at this price, it's also your excuse to get that laser printer you always wanted. (Lower cassette optional.)

$799



HP LaserJet IIIP Printer

Whole Earth makes the super-advanced but hard-to-get LaserJet IIIP available again. It's compact but powerful, with faster print speed than other printers in its price range, plus built-in type scaling and upgradeability to PostScript for PC and Macintosh.

Berkeley
2990 7th & Ashby
(510) 845-3000

San Rafael
863 E. Francisco Blvd.
(415) 459-3533

San Francisco
401 Bayshore Blvd.
(415) 285-5244

Concord
Willows Shopping Center
(510) 686-2270

San Mateo
Island Shopping Center
(415) 578-9200

San Jose
3530 Stevens Creek Blvd.
(between Winchester & San Tomas)
(408) 554-1500

Sacramento
3130 Arden Way
(916) 489-1000

0% FINANCING Zero% Financing 6 Months FOR 6 MONTHS

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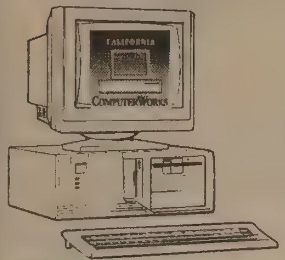
WHOLE EARTH

Brand Names & Warehouse Prices.

California Computer Works. Once again, California is first.

THE ONLY PLACE ON Earth TO BUY COMPUTERS



$699. w/40 MB HD

386SX-25 MHz Desktop

- 1-year depot warranty
- Windows 3.1
- DOS 5.0
- SVGA w/512k video memory
- 200 watt power supply
- 2 MB RAM
- McAfee Antivirus
- 3-1/2" & 5-1/4" drives
- 101 keyboard
- Power Menu

CCWSCA0014

Monitor Extra

CALIFORNIA
COMPUTERWORKS

$999. Color Monitor w/40 MB HD

486SX-25 MHz Mini-Tower Complete System

- 1-year depot warranty
- DOS 5.0
- 1 MB RAM
- 101 keyboard
- McAfee Antivirus
- Power Menu
- 200 watt power supply
- SVGA w/512k video memory
- 3-1/2" & 5-1/4" floppy drives

#CCWSCA0017

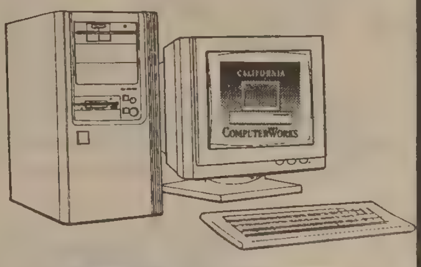
CALIFORNIA
COMPUTERWORKS

$1179. Color Monitor w/105 MB HD

386DX-40 MHz Mini-tower Complete System

- 1-year depot warranty
- Windows 3.1
- DOS 5.0 • 4 MB RAM
- SVGA w/512k video memory
- 64k RAM cache
- 200 watt power supply
- 101 keyboard
- 3-1/2" & 5-1/4" floppy drives
- Power Menu
- McAfee Antivirus

#CCWSCA0012



$1899. w/170MB HD

486DX-50 Mid Tower

- 1-year depot warranty
- Windows 3.1
- DOS 5.0 • 4 MB RAM
- SVGA w/512k video memory
- 64k RAM cache
- 200 watt power supply
- 101 keyboard
- 3-1/2" & 5-1/4" floppy drives
- Power Menu
- McAfee Antivirus

#CCWSCA0002

Monitor Extra

SPECIALS THIS MONTH

TOSHIBA
T3300SL

TOSHIBA

T3300SL Notebook

Introducing the T3300SL, Toshiba's powerful i386™SL VGA notebook with advanced battery management capabilities.

- 25MHz i386SL processor
- 80 MB Hard Drive • 2 MB RAM
- VGA display with 32 gray scale capability

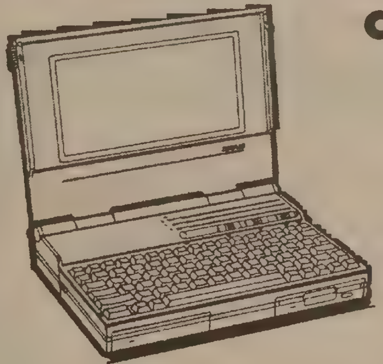
Limited Supply.

$2549

COMPAQ

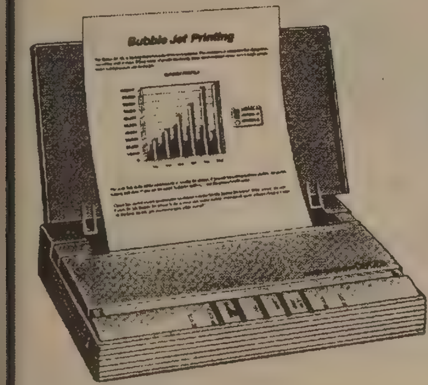
NEW!

Compaq Contoura 386SL-25 MHz Notebook



- 1-year onsite warranty • 60 MB hard drive • High-contrast VGA display
- 3-1/2 hour rechargeable battery pk.
- Smart hibernation and auto-off • DOS 5.0 pre-installed• 2 MB RAM expandable to 10 • QuickLock key protects your data

$1999



Canon

Canon BJ10ex

The Canon BJ10ex gives you high-quality document, anywhere, anytime. This portable printer has 360 dpi resolution and battery operation. Optional battery and sheet feed.

$319

Avanti 486

486SLC-25 MHz Notebook

- 80 MB hard drive
- Send/receive fax modem
- 4 MB RAM; 1K on-chip cache
- Windows 3.1 & mouse
- DOS 5.0
- WinFax
- Carrying case

#000048601

$2949

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San Francisco
Hours:
Sat-Wed: 10am-6pm • Thurs & Fri 10am-8pm

Concord
Hours:
Mon-Fri: 10am-6pm • Sat & Sun: 10am-6pm

San Mateo
Hours:
Mon-Fri: 10am-9pm • Sat: 10am-6pm • Sun 11am-6pm

San Jose
Hours:
Mon-Fri: 10am-9pm • Sat & Sun: 10am-6pm

Sacramento
Hours:
Mon-Fri: 10am-9pm • Sat & Sun: 10am-6pm

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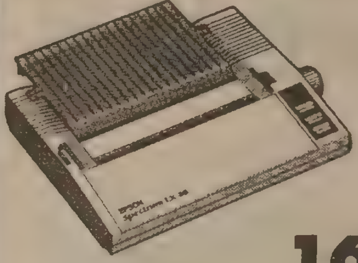
Zero% Financing 6 Months

5

THE ONLY PLACE ON Earth TO BUY COMPUTERS

EPSON



Epson LX-810

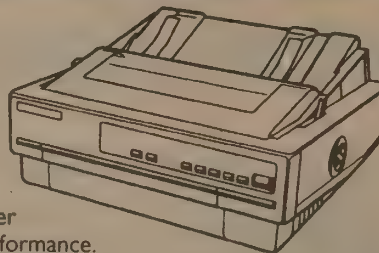
9 Pin • SmartPark™ paper handling • 200 CPS Super draft • 30 CPS NLQ • High resolution graphics

169.

LQ-570

This 24 pin printer utilizes scalable fonts, enhanced graphics, and advanced paper handling to offer better performance.

269.



IBM Business Partner
Authorized Advanced Products Dealer

Monitor Included

intel inside

IBM® PS/1® Expert Model 2155-S14

- 1-year warranty
- 386SX-25 MHz processor
- 2 MB RAM (expandable to 16)
- 3-1/2" disk and 5-1/4"drives
- 14" SVGA color monitor
- 170 MB hard drive
- DOS 5.0 • Windows 3.1
- Microsoft Works for Windows
- 512K video memory
- Virus protection
- 3 months free Prodigy®
- Easy built-in help system & tutorial
- PS/1 Club for 20-hour help via modem
- 5 easy-access expansion slots.

Limited Supply

$1499

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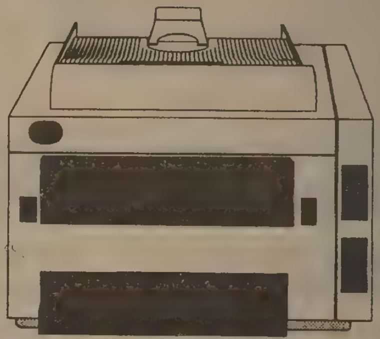
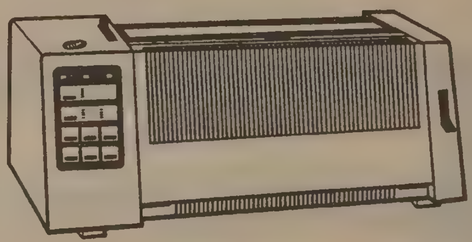


IBM® Laser Printer E

IBM's most affordable laser printer is built to fit on any desktop, prints 5 pages per minute at a sharp 300 dpi, and is built to meet demanding IBM standards.

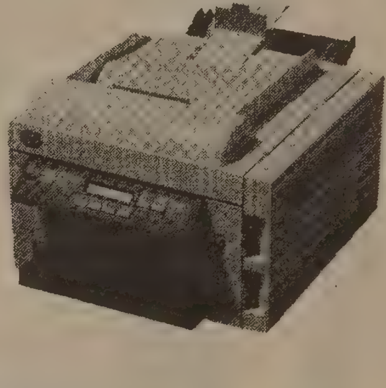
829.



IBM® PPSII 2380

IBM takes impact printing seriously as you and your business. This solid, reliable 9-pin printer is built with a straight paper path so six-part forms and thick paper print right the first time.

$319



IBM® Laser Printers 6 and 10

IBM's Laser 6 and Laser 10 come standard with a 200-sheet input tray, and IBM's Print Quality Enhancement; they grow with your business with optional envelope and extra paper drawers and an option for PostScript.®

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Creek Blvd
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(408) 554-1500

Sacramento
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(916) 489-1000

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FOR 6 MONTHS

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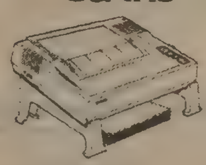
WHOLE EARTH

6

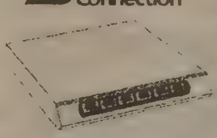
Avalanches of Accessories

CURTIS



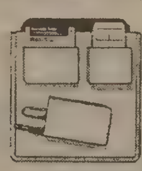
Universal Printer Legs
$5.95

System Connection



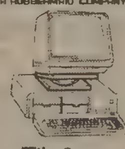
Power Control Center SP1000
$15.95

BASIC NEEDS



Utility Pack
$7.95

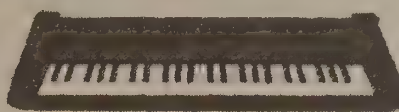
MicroComputer Accessories, Inc.
A RUBBERMAID COMPANY



Tilt & turn monitor stand
$13.95

THE SOFTWARE TOOLWORKS

THE MIRACLE PIANO TEACHING SYSTEM



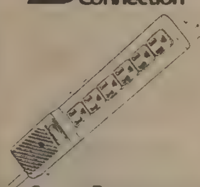
Software Toolworks

The Miracle Piano Teaching System

The first keyboard that teaches you how to play! • Pro keyboard with 49 large velocity-sensitive keys, 128 instruments and sounds • Full orchestral accompaniment • Flashcards, demo video games, practice sessions, all designed to help you learn how to play piano.

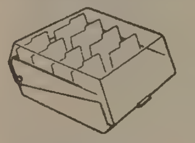
MAC .... $429.
DOS .... $399.

System Connection



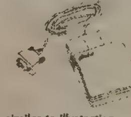
Surge Protector
$4.95

INLAND



3.5" BOX
HOLDS 80 DISKS!
$4.95

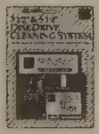
System Connection



similar to illustration

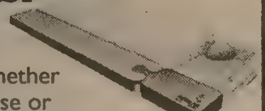
Mouse w/software
AC-ME01
$9.95

ALLSOP
Dual Disk Drive Cleaner CK.-50



$5.95

"Puzzle Pieces" Mouse/Wrist Pad Set

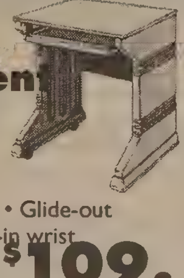


Protect your wrists whether you're using your mouse or keyboard. "Puzzle" design lets you take the pieces apart for your convenience.

$8.95

MicroComputer Accessories, Inc.
A RUBBERMAID COMPANY

Space-Efficient Workstation



A mobile, compact and self-contained computer desk for the home or office • Glide-out keyboard drawer with built-in wrist rest/storage compartment #1050

$109.

TDK
Micro Floppy Disk
MF-2HD

TDK.

TDK 3.5" HD Disks

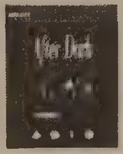
Choose the top name in magnetic media for your valuable data. (Sold in 10-packs only)

SOFTWARE

Prince of Persia from Broderbund

Animated game of the year, with Arabian Nights theme and endlessly challenging levels.
25.

After Dark



Wacky animations or gorgeous changing patterns to fight screen burn-in and enhance your office. A must-have!
25.

Kaboom

Scores of humorous digitized sounds to replace your Mac's regular beeps and event sounds.
25.

Carmen San Diego (all editions)

All-time bestsellers with great sounds and graphics. Kids learn geography, history, and more as they track down the world's most insidious crook and her gang.
Excluding CD ROM and deluxe versions
35.

SAM Anti-virus

Protect your computer from unwanted software guests. From Symantec, the leader in virus insurance.
59.

My Advanced Label Designer

With My Advanced Label Designer, you can pump out every kind of Avery label, audio and video cassette labels, even signs and flyers. Super-easy to learn.
Macintosh 35. Windows 35.

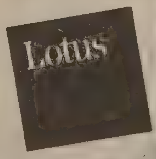
Microsoft Word

The best-selling word processor for the Macintosh and Windows is easier with drag-and-drop editing and built-in grammar checking.
Macintosh 289. Windows 299.

Microsoft Excel

Bill Gates ordered the Microsoft team to create the best spreadsheet ever. Now Whole Earth offers it at the best price ever.
Macintosh 299. Windows 329.

Lotus 1-2-3



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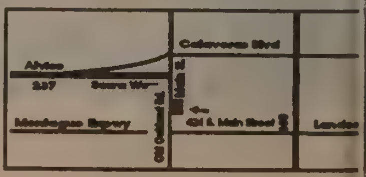

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- Five 16-bit slots and one 8-bit slot
- 8 SIMM sockets for up to 32M DRAM
- INTEL 80486-50MHz CPU

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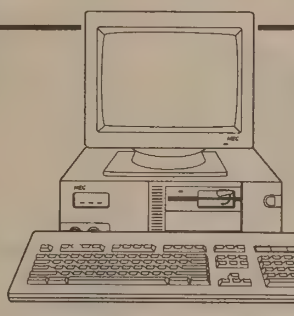

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- 1.2M OR 1.44M FD
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- 101 KEYBOARD

386-33/40 $880/$890

- MB WITH CPU
- 1M DRAM
- 1.2M OR 1.44M FD
- 80MB HD
- MINI-TOWER
- 230 W POWER SUPPLY
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- 64K CACHE RAM
- SVGA CARD 512K
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- 101 KEYBOARD

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- MB WITH CPU
- 1M DRAM
- 1.2M OR 1.44M FD
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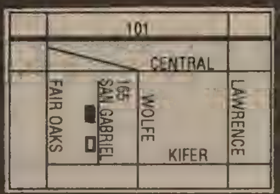

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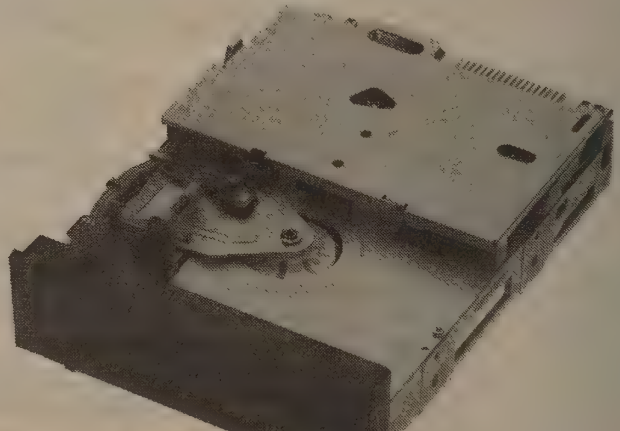

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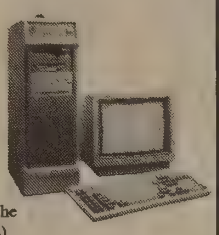

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- *8MB DRAM 70ns (up to 64MB)
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- *Logitech 3-Buttom Mouse w/ Pad
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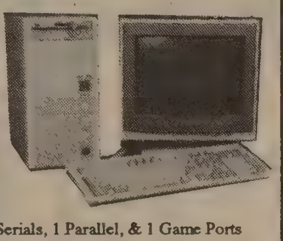
386-25SX/25DX MHz SVGA 40MB HD



- *386-25SX/25DX MHz
- *2MB DRAM 70ns (up to 8MB)
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Complete Sys. $ 849/899

(32KB Cache Memory add $40)

486-25SX/33/50/66 MHz 64KB Cache 120MB HD ISA

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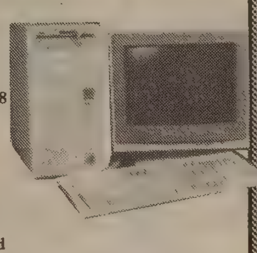
386DX-33/40 MHz ISA 64KB Cache 105MB HD



- *386DX-33/386DX-40
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- *4MB DRAM 70ns (up to 32MB)
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- *Microsoft Compatible Mouse w/ Pad
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- *Mini Tower Case w/ 230 Watts Power Supply
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- * Logitech 3-Button Mouse w/ Pad
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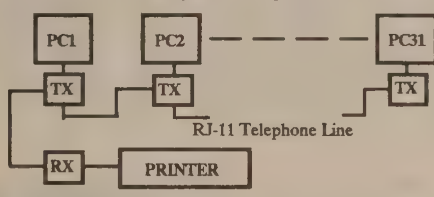

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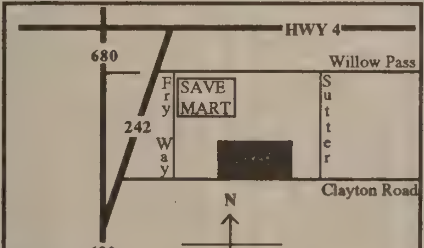

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Medium Tower Case, 4MB, IDE Cont. 2SPG, 1.44 Floppy Drv, 80MB Hard Drive, 512K SVGA Crd, SVGA .28 Color Monitor, 101KB, Mouse, DOS 5 WIN 3.1........$1020/1060

486 DX 33 64/256K Cache
Full Tower Case, 4MB, IDE Cont. 2SPG, 1.44 Floppy Drv, 170MB Hard Drive, 1MB SVGA Crd, SVGA .28 Clr Monitor, 101KB, Mouse, DOS 5, WIN 3.1..........$1615/1650

386 SX 16/25 MHz
Mini Tower Case, 2MB, IDE Cont. 2SPG, 1.44 Floppy Drv, 80MB Hard Drive, 512K SVGA Crd, SVGA .28 Color Monitor, 101KB, Mouse, DOS 5 WIN 3.1...........$865/875

486 SX 20/25 MHz
Medium Tower Case, 4MB, IDE Cont. 2SPG, 1.44 Floppy Drv, 120MB Hard Drive, 1MB SVGA Crd, SVGA .28 Color Monitor, 101KB, Mouse, DOS 5 WIN 3.1.......$1120/1155

486 50 DX 256K Cache ISA/EISA
Full Tower Case, 4MB , IDE Cont. 2SPG, 1.44 Floppy Drv, 200MB Hard Drive, 1MB SVGA Crd, SVGA .28 Clr Monitor, 101KB, Mouse, DOS 5, WIN 3.1..........$1995/2375

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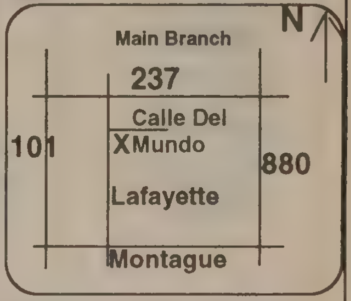

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- Landmark=21
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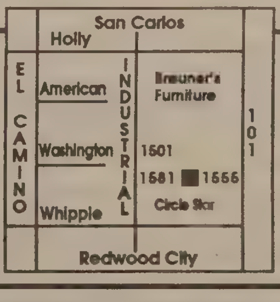

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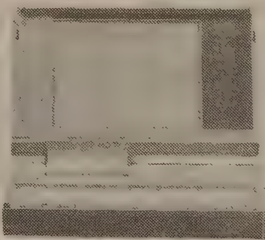

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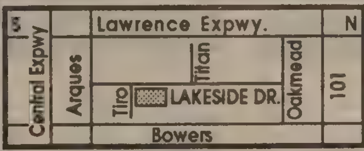

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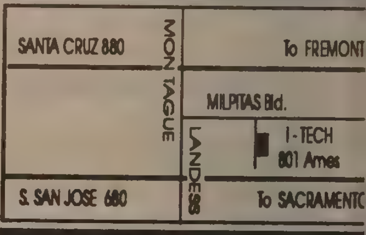

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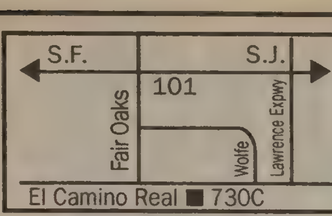

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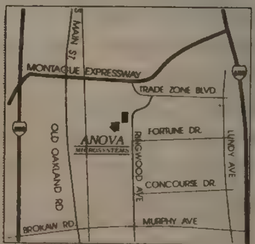

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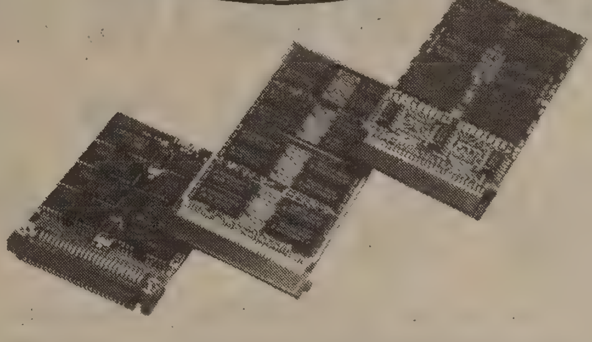

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What's Next?

NANOTECHNOLOGY For Manufacturing

(Originally given as a talk at Autodesk, this paper is widely regarded as an excellent introduction to the subject of nanotechnology, and we're pleased to be able to bring it to you here. By permission of the author, this article may be freely reproduced.—eds.)

BY JOHN WALKER

These are indeed extraordinary times we're living through. Few people are lucky enough to live at a time when their chosen field of interest becomes the center of a technological revolution that changes the face of the world. We've all shared that good fortune; the success of Autodesk in so short a time is evidence of how rapidly and how completely the evolution of computers has changed the way design and engineering are done and has reshaped the very terrain on which businesses compete.

Yet all of these remarkable events were predictable, at least in general outline, more than twenty-five years ago. I remember, like yesterday, the afternoon in the spring of 1968 when, after I first learned about the technologies used in the crude integrated circuits of the time, it hit me. There was no fundamental physical reason you couldn't put a whole computer on a single chip. It was just a matter of engineering, money, and time.

Now I certainly didn't know when it would happen, and I doubt anybody anticipated price and performance reaching their current levels, but the direction and the goal was clear. It made engineering and economic sense, there was no reason it wouldn't work, and each intermediate step along the way would clearly pay for itself in commercially successful products. That pretty much made it inevitable.

This is the kind of reasoning I'm going to be using in this presentation—projecting readily predictable trends forward and asking the question "How far can we go, and what happens when we get there?" Some of the conclusions that seem almost inevitable have profound consequences that are not just interesting, but important for companies like Autodesk who wish to grow and prosper in the coming years.

WHAT'S BEEN HAPPENING

Let's start by looking at the key trend that's driven the entire silicon revolution. It's really very simple: making things smaller, or in engineer-speak, device scaling. In the early days of transistors, it was observed that when you made a device smaller, you got the best of everything. It ran faster, it used less power and ran cooler, and since you could pack a lot more of them on a single wafer and the cost of processing a wafer was the same regardless of what was on it, the price per device went down.

After the first primitive integrated circuits were made in the late 1950s, the incentive to miniaturize became even more compelling. By reducing the size of devices further, more complex circuitry could be packed onto each chip. And remember, all chips cost roughly the same to make, regardless of what they do or how complicated they are.

Integrated circuits started out as devices with just two transistors on a die, and progressed to building blocks for larger systems. Finally, in the mid-1970s, practical microprocessors—entire computers on a single chip—appeared. These initial devices were crude, which led many observers to dismiss them as toys. Indeed, none of the major computer manufacturers of the time played a significant role in the development of what is now the universal way of making computers.

It was the chip makers who pioneered microprocessors and developed them to their current state. Why? Because they were familiar with the inexorable consequences of device scaling, and they knew how far, in time, it would carry the microprocessor. How far have we come? I have a little program, called the Autodesk Benchmark, that I run on various computers to get a feel for how fast they'll run engineering software like AutoCAD. Here's an anthology of results, spanning the history of Autodesk, from 1982 through the present.

In 1982, personal computers were becoming seen as useful tools for serious work, but they were still very, very slow for computationally intensive tasks. A typical low cost PC such as a Commodore took close to an hour to run the program. (Putting this in perspective, to do the same job by hand with a pocket calculator would probably take a whole day.)

More expensive and powerful PCs emerged and slowly reduced this time, making more and more complicated tasks practical. Then, in 1984, the 80286 appeared. The impact of this machine on Autodesk can't be underestimated. Calculations that took half an hour on the PCs that existed when we started the company could be done in a minute on the PC/AT. It's no coincidence that Autodesk's sales took off through the roof right about that time.

But it didn't stop there. Three years later, workstations and PCs based on the next generation of chips had cut this time by another factor of ten—from a minute to about five seconds. And now the newest, shiniest crop of machines just arriving have handed us another factor of twenty—down to less than a third of a second. In eight years, we've seen a task that originally took an hour reduced, by the simple consequences of device scaling—making things smaller—to less than a third of a second.

This kind of technological progress is hard to comprehend, even if you've lived through it. If automotive technology had advanced an equivalent degree, your car that went 55 mph in 1982 would today go 615,000 miles an hour, with the same gas mileage and price. You could drive to the Moon in around twenty-five minutes, if you beat the rush hour and had a good radar detector.

So the inevitable question is: Just how long can this go on? There are reasons to believe the end of progress in electronics through pure application of device scaling may be within sight, although not imminent. When the limits of device scaling are encountered, the linear extrapolation that has driven our industry since the 1950s will come to an end and we'll enter another era. Before getting into that, I'd like to talk about some different perspectives on the kind of exponential growth we've been seeing.

continued on page 123

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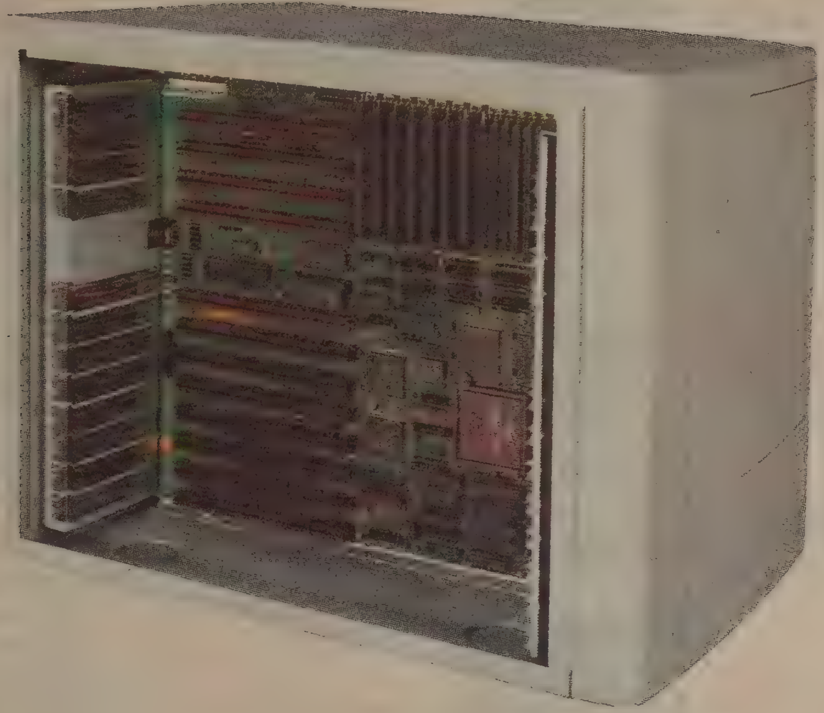

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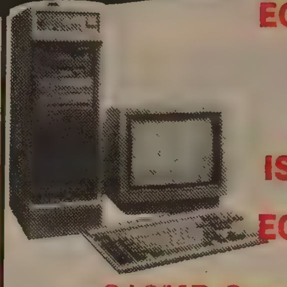

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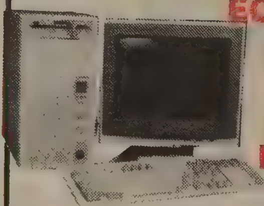

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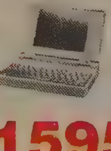

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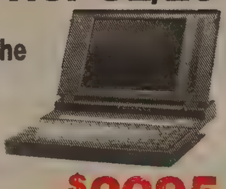

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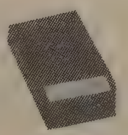

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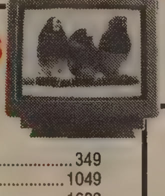

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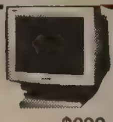

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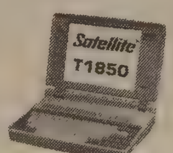

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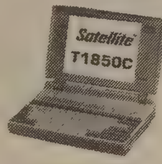

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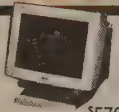

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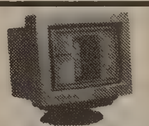

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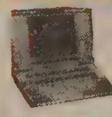

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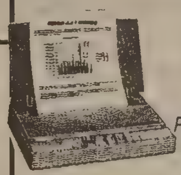

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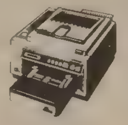

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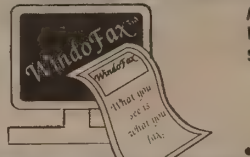

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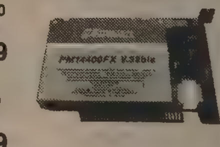

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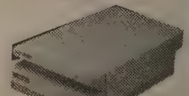

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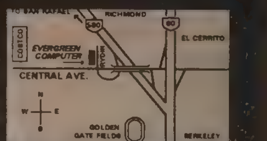

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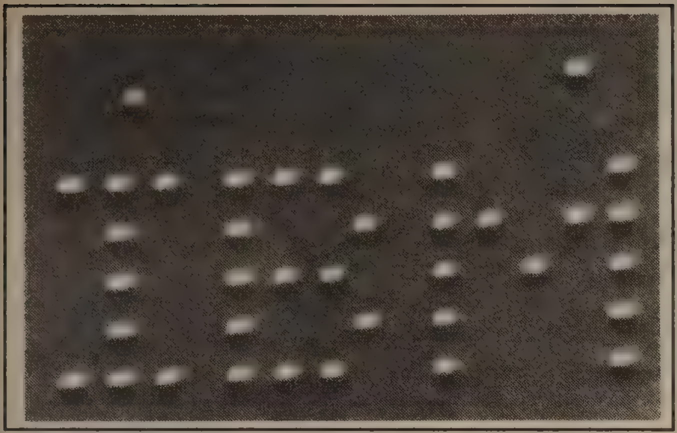

"You can not only put atoms right where the chemist wants them, you can put them right where the marketing department says to, as well"
(photo courtesy of IBM Research Division, from Unbounding the Future)

Continued from page 116

The first is what I call the "Oh Wow" view of things. You look at the climbing exponential curve and draw the obvious conclusion—it's going to go on climbing to the sky forever.

Now I don't mean to disparage this view; most people err on the side of conservatism—they don't realize just how far a trend can go once it's set into motion. But nothing grows forever. In evaluating any growth trend, whether CPU performance at constant price, world population, or Marin County real estate prices, you have to ask, "What are the fundamental limits to this growth?"

This kind of analysis leads to a different perspective I refer to as the "Oh Well" view. Rather than continued exponential growth, the trend continues until it begins to encounter limits that constrain it, then it flattens out after achieving maturity.

This view is very popular among mainstream business analysts since, especially if you cook up some suitably bogus constraints, you can always justify cutting research and development, reject innovative market expansion and distribution ideas, and relegate the business to a mindless caretaker status once it has reached "maturity." For example, once you've sold a video tape recorder to every TV station, how many more could you possibly sell?

Again, we're not seeing the whole picture. Taking a still longer view gives us what I call the "Oh Shit" perspective: after the limit comes the plunge.

Nothing in this world is static and nothing, regardless of maturity, lives forever. When a technology, or market, or species ceases to grow and develop, it's the strongest possible indication that it's become a dead end—its hand is played out—that decline and replacement are only a matter of time. To understand why, we have to take an even longer perspective.

For this is what's really happening. Progress is made in a series of waves. Each starts with a giddy period of exponential growth. That's when it's fun, when everybody's jumping in, working twenty-four hours a day, losing money hand over fist, and having a wonderful time.

As the curve really begins to soar, it starts having an impact on the established, mature technologies that went before. This is a general-purpose graph [*a curve rises, plateaus, and plunges after being overtaken by another rising curve, which plateaus, and...*]; it's my worldview on a single slide. You can read it as a picture of transistors replacing vacuum tubes and then being supplanted by integrated circuits, or of mainframes, minicomputers, and personal computers, of turnkey mainframe CAD companies, workstation-based CAD, and mass-market desktop CAD software, or for that matter, of species diversification and extinction in an ecosystem. It doesn't matter. It's all evolution in action.

TECHNOLOGICAL TRANSITIONS

I call the points where a rapidly developing technology takes off and

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starts to displace its predecessor "technological transitions." These are perilous times, but they are the times when great industries are founded. Rarely do leaders of the last technology play a significant role in the next; they've usually become encumbered with a bureaucratic superstructure focused on managing a mature market but incapable of acting on the small scale with the rapid pace that's needed to develop its successor—the new market that's inexorably displacing them. Having grown out of their period of rapid growth, they've forgotten it's possible. They value caution over the very assumption of risk that built their industries in the first place, and through caution, they place at risk everything they have.

Technological transitions are great times to make gobs and gobs of money. Autodesk got on board a relatively minor technological transition in 1982—the second subwave of personal computers, which was a ripple of the microprocessor surge, itself part of the semiconductor tide, contained within the automation industrial revolution. Even so, we managed to turn a hundred thousand dollars into more than a billion in less than eight years. Just imagine what you could do with a real industrial revolution.

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Everybody has their own list of industrial revolutions, and here's mine.

A couple of million years ago we figured out that bashing things with rocks you'd worked into special shapes was better than bonking them with any old random rock you picked up. Suddenly you had tools, craftsmanship, carpentry, weapons, wealth beyond imagining, and global proliferation of a previously obscure critter. This was an information revolution: using knowledge to transform existing materials into useful forms.

All of this was based on natural materials, picked up from the Earth or taken from plants and animals. Then, about 5600 years ago, on a sunny Thursday morning, somebody figured out how to extract copper from yucky-looking rocks. Now people had access to new materials—technology was no longer limited by what was lying around; it could make new substances and build with them. This led to bronze, iron, alloys, alchemy, chemistry, and steel. This was a material revolution; enabling new technologies by creating substances not found in nature.

All of industry until the eighteenth century was powered by the energy of human or animal muscles, or natural energy sources like falling water and the wind. This limited both the scope and scale of what could be done. The advent of practical steam power swept away these limitations, spawning trains, steamboats, satanic mills, and capitalism. This was an energy revolution.

As the scale of industry grew, economies of scale could be realized by standardization and interchangeability of parts. These trends ulti-

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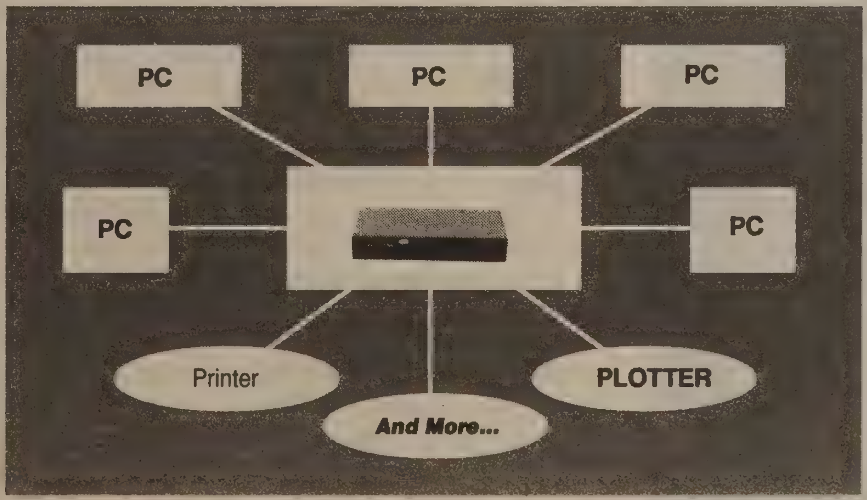

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mately led to an entire industrial system focused around mass production of largely identical objects. This is harder to date. I use 1908, the date of the first automobile assembly line, as the milestone of mass production. Mass production was essentially an information revolution: it embodied a uniform set of specifications in huge numbers of objects, thereby reducing their cost so many more people could afford them than ever before.

I consider automation to be the most recent industrial revolution. Until the advent of mechanical, electrical, and electronic computers in the twentieth century, any computation or information processing required the attention of a human being and necessarily proceeded at the pace a human could work. The computer revolution, which I date here from Eniac in 1946, has been an information revolution that has transformed not only the mechanics of industry, how we make things, but also the structure of our organizations and societies. Ironically, mass production, an essential precursor of automation, is becoming less important as the introduction of intelligence throughout the manufacturing process allows more flexible forms of production.

Before I get into the details of what's about to happen, I want to make sure we understand the territory. We're about to discuss things that range in size by a factor of a billion to one, so it's useful to go over the distance scale so we don't confuse millions and billions the way the politicians do.

Let's start with the measure of all things, a human being. Humans are on the order of meters in size, actually closer to two meters, but we can ignore ones and twos when talking about factors of one thousand, as we're about to do.

Most of the history of technology has been built to this scale, and tended to look something like this [*slide of old-fashioned printing press*]. If an object has to be assembled by people, and in many cases powered by people and operated by people, it doesn't make any sense to make it smaller than people can reasonably use, notwithstanding the design of modern car stereos.

The size of mechanical parts is governed by the materials that compose them and the scale of the machines used to fabricate them. Both imposed severe limitations on miniaturization throughout most of history, limitations that were surmounted only with great difficulty and expense when absolutely necessary, as in the design of watches.

Wherever technology leads us, effective design at this scale will remain important as long as humans use the products. This is the domain of user interface and ergonomics.

If we shrink down by a factor of a thousand, we arrive at the millimeter scale, where an ant is pretty big stuff. This is about the limit of what the human eye can effectively see unaided, or the human body can manipulate without mechanical assistance, so it's a convenient milestone on the road to Lilliput.

Here's an example of millimeter-scale technology. This, for those of you too young to remember or old enough to have had enough bad experiences and deliberately forgotten, is a vacuum tube. If you examine this device closely, you'll see that its fundamental geometry— the spacing of its grid wires, the distance from the cathode to the plate —are all on the order of millimeters. With the development of electronics, device scaling immediately became important: the smaller you made a tube, the faster it ran and the less power it used. Unfortunately, the fact that tubes had to be assembled from separate metal parts limited how much you could shrink them.

This particular tube is a 6SN7. That's the type used in the flip-flop circuit of the Eniac, the world's first electronic digital computer of 1946. Each tube, along with a handful of other parts, stored one bit of computer memory: RAM. The Eniac contained eighteen thousand tubes like this, occupied 3000 cubic feet of space, and required 140 kilowatts of electricity. It had about the computing power of a pocket calculator. It was a miracle of millimeter technology. Tubes like this aren't even made in the United States any more; this one came from the Soviet Union and cost $13. Interestingly, that's almost exactly the current price of an 80-nanosecond 1-megabit dynamic RAM, with a million times the storage capacity and 125 times the speed.

Which brings us to the next factor of one thousand in size, to the micrometer range that's the heart of microchip technology. All of these RAMs and ROMs and microprocessors have feature sizes on the order of micrometers. The entire march of processor technology I showed in the timing slide is essentially the story of learning to shrink our circuits from the order of tens of micrometers to single micrometers, and the frontier of electronics in the next several years will be shrinking further, down to fractions of a micrometer. And then what? Well, that's a very interesting question.

Here's a piece of silicon that's been machined into slabs a third of a micrometer wide. This is about the best we can do right now with conventional processing technology, and to give an indication of just how tiny that is, each of those slabs is smaller than the wavelength of deep violet light. Needless to say, this image is from an electron microscope, not an optical one.

All the way down to micrometers, we've been able to design circuits essentially the way we did in the days of vacuum tubes. Yes, the devices and fabrication technologies changed, but the rules of the game like Ohm's law remained the same.

Somewhere between half a micrometer and a tenth of a micrometer, these comfortable assumptions begin to break down. The weird world of quantum mechanics, where the wave nature of the electron becomes apparent, begins to become manifest at this scale and straightforward shrinking doesn't seem likely to work. This suggests we're already uncomfortably near the top of the curve for conventional electronics.

But how far are we from the theoretical limit? Just about another factor of a thousand, it turns out. If we shrink from a micrometer to a thousandth of that, a nanometer, we've reached the scale where atoms become tangible objects. A 1-nanometer cube of diamond has 176 atoms in it.

Designing at this scale is working in a world where physics, chemistry, electrical engineering, and mechanical engineering become unified into an integrated field. This field will be called molecular engineering, and I believe it will be at the heart of the next two industrial revolutions.

PLENTY OF ROOM

Over thirty years ago Richard Feynman pointed out that physicists knew no limits to prevent us from doing engineering at the level of atoms. His words are as true today as the day he spoke them.

Until recently, though, while the lack of physical limits was accepted as commonplace, molecular engineering was thought of as impractical, unnecessary, or requiring breakthroughs in knowledge and technique that placed it somewhere in the distant future. Many visionaries intimately familiar with the development of silicon technology still forecast it would take between twenty and fifty years before molecular engineering became a reality. This is well beyond the planning horizon of most companies.

But recently, everything has begun to change.

WRITING WITH ATOMS

In 1981, Gerd Binnig and Heinrich Rohrer of the IBM Zurich Research Laboratory invented the scanning tunneling microscope. This device, easily one of the most elegant and unanticipated inventions of the century, allowed imaging of individual atoms, and won Binnig and Rohrer the Nobel Prize in Physics for 1986. In 1985, Binnig and Christoph Gerber of IBM Zurich, along with Calvin Quate of Stanford, invented the atomic force microscope. This allowed imaging non-

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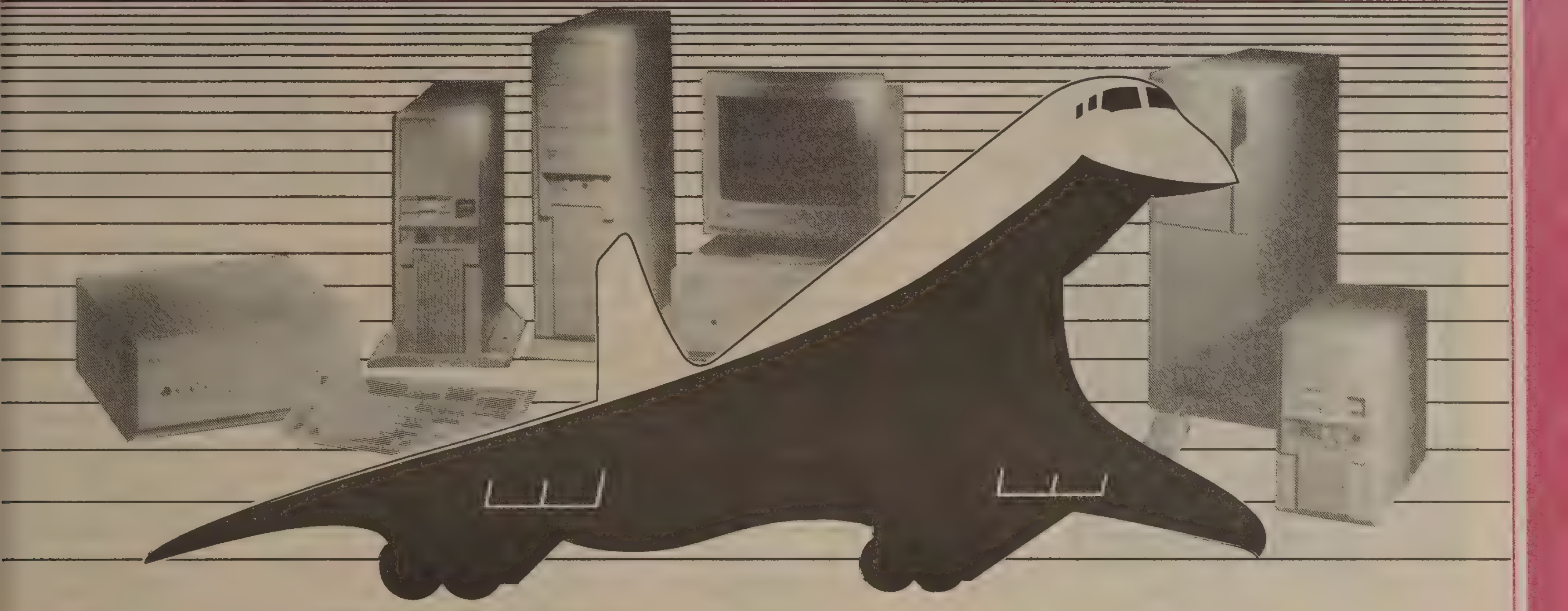

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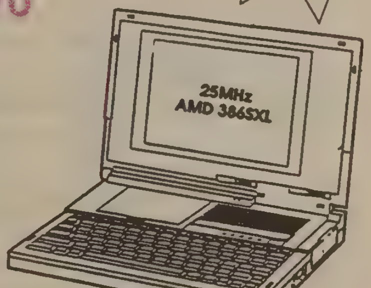

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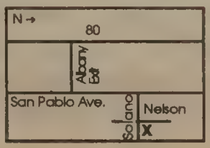

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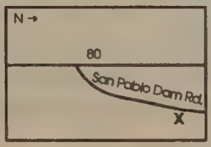

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Over thirty years ago Richard Feynman pointed out that physicists knew no limits to prevent us from doing engineering at the level of atoms.

conductive matter such as living cells to molecular (although not currently atomic) resolution.

Since then, every year has seen new inventions in the rapidly growing field of scanning probe microscopes. They're now imaging bits on magnetic surfaces, measuring temperature at microscopic sites, and monitoring the progress of chemical reactions. Recently, IBM San Jose used a scanning tunneling microscope to, in Feynman's words, put the atom right where the chemist says.

Here's a picture of xenon atoms on a nickel crystal, lined up in a row by pushing them into place with an STM tip. Remember, those bumps are individual atoms, and they've been moved precisely into position, in a row, one half nanometer from each other. [*Slide showing IBM spelled out using 35 atoms.*] You can not only put atoms right where the chemist wants them, you can put them right where the marketing department says to, as well.

Here, from the same paper, is a sequence of pictures showing a bunch of randomly positioned xenon atoms being aligned to spell out the name of the sponsor. Again, each dot in this picture is a single atom, and the letters are 5 nanometers tall.

Here's an illustration from a paper published a few weeks before the IBM result. The bottom picture shows an X drawn with an atomic force microscope on material adsorbed onto a zeolite crystal surface. The X is 8 nanometers tall, and it remained intact for the forty-five minutes it was monitored after being drawn there. This experiment was done with a desktop instrument no bigger or more complicated than a compact disc player.

MOLECULAR ENGINEERING

So what we're talking about is making the next big jump to building systems a thousand times smaller than the ones we're making today; to go all the way to the bottom and start working with individual atoms.

This is called molecular engineering, or nanotechnology. Eric Drexler defines this as control of the structure of matter at the molecular level, however achieved.

Technology has never had this kind of precise control; all of our technologies today are bulk technologies. We take a big chunk of stuff and hack away at it until we're left with the object we want, or we assemble parts from components without regard to structure at the molecular level. Precise atomic level fabrication has previously been done only by living biological organisms. We are entering an era when some of the barriers between engineered and living systems will begin to fall.

In fact, we're already building components on the scale of biological systems. The picture on the left shows a neuron net from a human brain with an integrated circuit component inset at the same scale. The picture on the right is a synapse—the interconnection of the wiring in the human brain, with a 1 micrometer scale. Remember that this is just about the feature size of the wires in our integrated circuits.

The huge difference in capability between engineered and biological systems is not just the materials from which they're made, it's that the fine structure of the integrated circuit stops with what you can see: there's nothing down below. Since we're forced to fabricate our circuits from bulk material, from the top down, they must be essentially two-dimensional. Biology builds its structures from the bottom up, at the molecular level, and in three dimensions.

Engineers are beginning to learn how to do this.

The challenges in scaling another factor of one thousand shouldn't be minimized. Developing millimeter-scale electronics and micrometer-scale integrated circuits wasn't easy, either, but after we overcame the initial obstacles, both progressed much faster and further than anybody initially expected.

The remarkable thing about molecular engineering is that it looks like there are many different ways to get there and, at the moment, rapid progress is being made along every path—all at the same time. In 1988, a group at Du Pont led by William DeGrado designed a new protein, called alpha-4, from scratch, and manufactured it in their laboratory. This protein, which never existed in nature, is more stable than natural proteins its size. Researchers around the world are now looking at proteins as molecular structures they can design and build, just as an IC designer lays out a chip.

Chemists are making progress in designing and synthesizing molecules that bind to other molecules at specific sites, facilitating the kind of self-assembly that occurs in biology. The 1987 Nobel Prize in Chemistry was awarded for just such work. I've already alluded to the feats accomplished so far with scanning probe microscopes. We now have a tool that lets us see and move individual atoms. STMs have also been used to pin molecules to a substrate and break molecular bonds. Eric Drexler [of Stanford] and John Foster of IBM have suggested in a recent paper in *Nature* that attaching custom molecules to the tip of a scanning microscope may allow assembling objects with up to ten thousand molecular pieces, with atomic precision.

The ability to model and simulate complex molecular systems has been growing rapidly in recent years, driven both by advances in raw computing power, but also by the development of better simulation techniques that now permit modeling of proteins composed of thousands of atoms.

Physicists and electrical engineers are making rapid progress in fabricating electron devices that work at the molecular level. In the past two years, Texas Instruments and Bell Labs have reported molecular-scale quantum transistors and have fabricated quantum wires with X-ray lithography. These quantum wires are on the order of 30 nanometers wide.

Materials scientists and mechanical engineers are fabricating new materials called "nanocomposites," made up of individual particles ranging from one hundred to one thousand atoms. These appear to have electrical and mechanical properties unlike any other engineering materials and may prove useful in the near future.

MOLECULAR ELECTRONICS

Even technologies with enormous potential can lie dormant unless there are significant payoffs along the way to reward those that pioneer them. That's one of the reasons integrated circuits developed so rapidly; each advance found an immediate market willing to apply it and enrich the innovator that created it.

Does molecular engineering have this kind of payoff? I think it does. Remembering that we may be less than ten years away from hitting the wall as far as scaling our existing electronics, a great deal of research is presently going on in the area of molecular and quantum electronics. The payoff is easy to calculate; you can build devices one thousand times faster, more energy efficient, and cheaper than those we're currently using—at least one hundred times better than exotic materials being considered to replace silicon when it reaches its limits.

Continued on page 286

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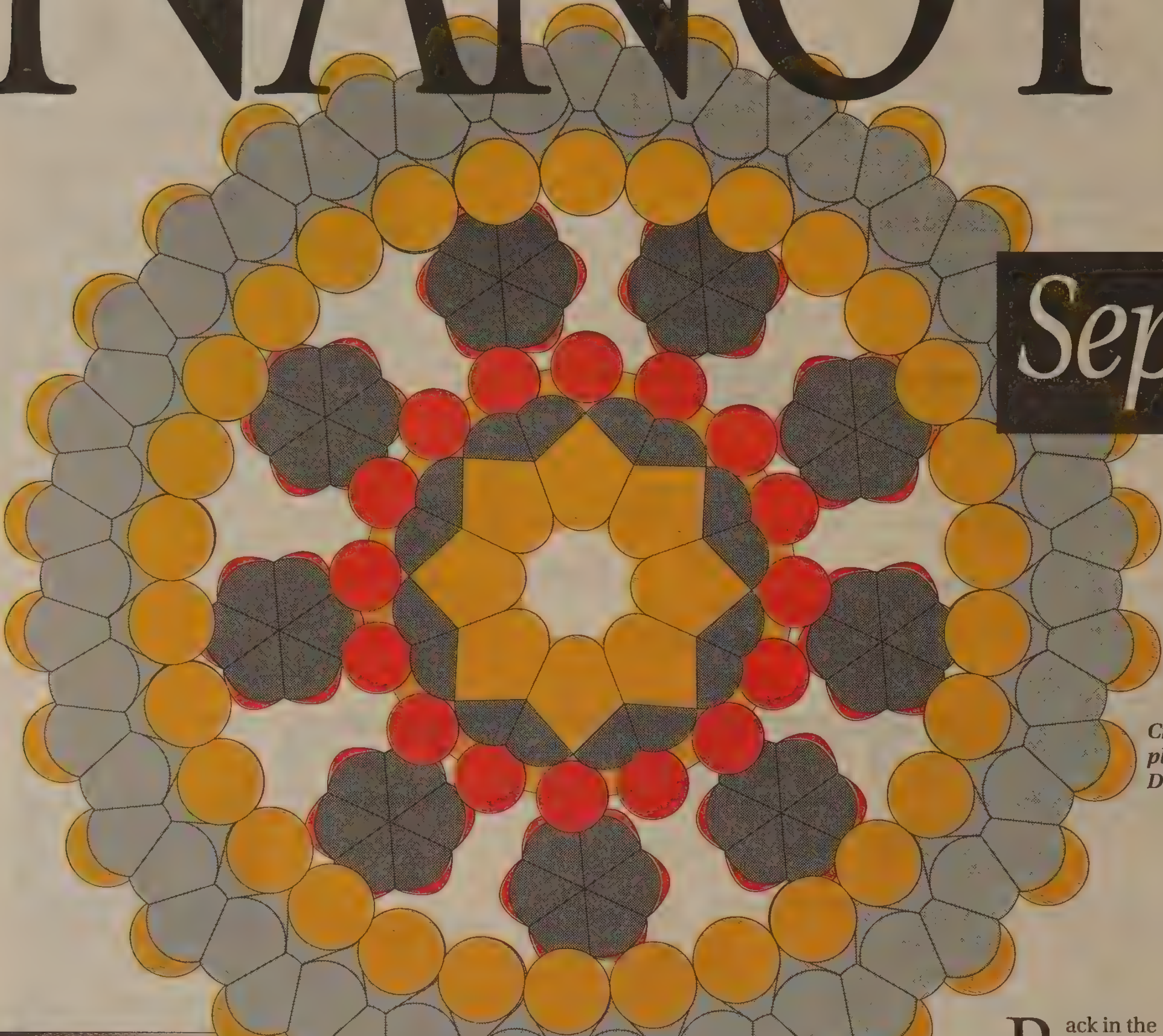


Cross section of a nanometer-scale planetary gear, designed by Eric Drexler and Ralph Merkle.

AN INTERVIEW WITH ERIC DREXLER

Back in the 1970s, while an undergraduate at MIT, Eric Drexler read about the advancing state of research in molecular biology, where, he says, "researchers kept discovering new molecular machines within organisms and studying how they worked. I began to wonder what kinds of things we'll be able to build when we have tools we don't have yet, tools able to build molecular machines."

Not without a fair amount of struggle for acceptance in academic circles, Drexler ultimately received a Ph.D. in Molecular Nanotechnology from MIT, and is currently a Research Fellow of the Institute for Molecular Manufacturing. He is also the president of the Foresight Institute, a Palo Alto-based nonprofit educational organization founded, as he explains it, "to gather, digest, and distribute information on molecular nanotechnology and related advanced technologies, discussing both what's happening in the laboratory today, what the pathways are, what the long-term technological capabilities are, and the consequences for policy and decisions that need to be made."

HNOLOGY

Myth From Reality

BY MARY EISENHART

PHOTOS: GLENN MATSUMURA

Since Drexler's first book, *Engines of Creation* (Doubleday), first appeared in 1986, nanotechnology has garnered enthusiastic interest (and equally vigorous nay-saying) in the technical and scientific communities. It has also brought on a bizarre assortment of half-baked speculation, snake oil, and pie-in-the-sky schemes.

This, Drexler points out, is only natural for discussions of products likely to be decades away. And while the inevitable onslaught of flakes and charlatans is a known road hazard on the technological highways—particularly when sober scientists discuss nanomachines dedicated to killing cancer cells or reversing the aging process, or food production reminiscent of the have-it-your-way gizmos on *Star Trek*—it need not detract from useful study.

"It's very important to distinguish between what is near-term and what is long-term," says Drexler, "and also between what's real and unreal. And to not confuse 'long term' with 'unreal,' which is a classic American disease."

While in the United States, there is little funding (public or private) committed to research in the field, the situation in Japan is quite different, with MITI announcing last year a commitment of $185 million to nanotechnology research, and the Science and Technology Agency funding research projects aimed at building complex structures, atom by atom. One such project, the Aono Atomcraft Project, has been taking a hands-on approach that parallels theoretical studies by Drexler and Xerox PARC researcher Ralph Merkle, but, says Drexler, "Aono has funding and a laboratory. Ralph and I are both doing theoretical studies—studying what kinds of systems can be built in the long term, and how to get there. Which is different from taking steps in a laboratory along one of these paths. And also much less expensive!" he laughs.

"I don't know of any people who have looked closely at molecular manufacturing, and understand the physical mechanisms involved and the analysis behind it, who are not of the opinion that, yes, this is going to be a dominant manfacturing technology in the twenty-first century. Certainly that it's going to be used to make computers. Quite likely that it's going to be used to make a much

I expect in the ultimate destiny of this that there's going to be an appliance that sits on your desktop that can make anything. I don't expect that to happen within the lifetime of AutoCAD Release 13 or 14. But that's where it's all going.

This week we're shipping HyperChem, which lets you design objects at the molecular level. The technology is going to go on scaling down until we have the same level of fine-grained control over the structure of matter that biology has been using for the last billion years or so. And at that point, we're going to be able to make anything from a digital model.

That's going to change the world, beyond comprehension, I think.

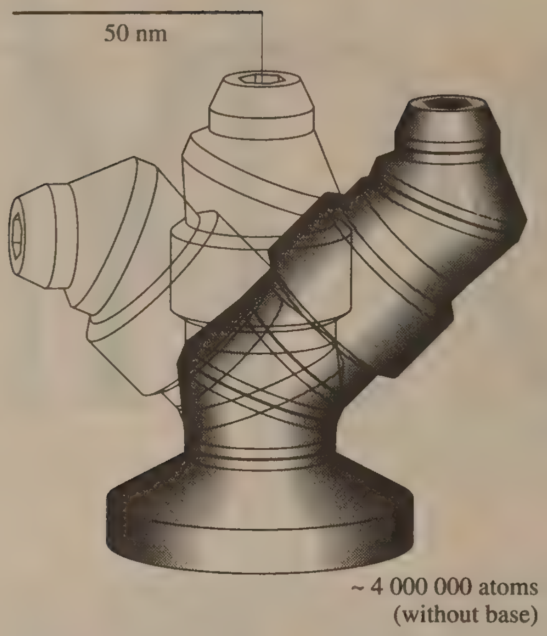
—John Walker,* MicroTimes *#95

Imagine that many of the key developments of twentieth-century technology were consequences of something that could be figured out in the nineteenth century, but still would take many years to implement. So in the nineteenth century, someone was able, not to understand the whole of the twentieth century, but to understand that it would be possible to develop antibiotics, nuclear weapons, and farm technologies that made it possible to feed the population with only a few percent of the population working in agriculture. Let's say that this was determined at a time when most people were farmers, when infectious disease was a dominant cause of death, and when no one had any concept that it was possible to destroy the planet.

One could imagine a range of scenarios where the ability to have food without people working on the farm produces unimagined wealth and leisure and is portrayed as Utopia. One can imagine the existence of nuclear weapons being portrayed as a sure recipe for our immediate obliteration, and the idea of penicillin eliminating a wide range of infectious diseases as a fantasy—"a pill that cures all these things?"

The reality has been much more complex than any of those views, and much of what has happened would have been rejected as a fantasy at the time. Indeed, many correct predictions at various times were rejected in just that manner. I think that's a useful comparison to judge what's being said now, and how it may be compared to the eventual reality.

— Eric Drexler



"The things that molecular machines do in biology include taking molecules and putting them together in complex patterns to make other molecular machines. A wide range of products—everything from protein molecules to redwood trees—is made by biological molecular machines."

broader range of products," says Drexler. And the Japanese, historically more concerned with the long term than the quarterly bottom line, are putting significant resources into nanotechnology. "Rather than seeing twenty years as forever, they see it as a fraction of a human lifetime, as planning for one's own personal future, for that of one's friends and relatives and children."

So, for now, Drexler and his colleagues are engaged in research and information dissemination, taking the small steps along the path to a radically different future. In November, the Foresight Institute will present the First General Conference on Nanotechnology: Development, Applications, and Opportunities in Palo Alto. The conference lasts three days and features discussions of issues ranging from "Intelligent Computation in the Age of Molecular Manufacturing" by MIT's Marvin Minsky to "Designing Molecular Components" by Ted Kaehler of Apple Computer to "Nanotechnology R&D Sponsorship" by Neil Jacobstein of Cimflex Teknowledge.

For the last 4½, Drexler's been working on the just-published *Nanosystems: Molecular Machinery, Manufacturing, and Computation* (Wiley-Interscience), a college-textbook-level work intended to serve as a foundation for the studies of future researchers in the field. In 1991, he and coauthors Chris Peterson and Gayle Pergamit published *Unbounding the Future* (Morrow), which explores, at a level accessible to a nontechnical audience, the basic concepts and social implications of nanotechnology.

With a view to similar exploration, we recently paid Drexler a visit.

What do you mean by "nanotechnology"?

Since 1986, it's become a buzzword in science and technology, but it has been applied to anything on a nanometer scale, rather than to what I've been terming here "molecular manufacturing."

There are two basically different approaches to making small structures. One is the top-down approach that's been followed in the semiconductor industry, where you use large machines to make small features, and you strive to make smaller and smaller features every year, while still keeping enough control of the shape of those little irregular structures that they do what you want. The payoff from this has been enormous; that path has a considerable distance to go, and the computer capacity that results will contribute greatly to the development of molecular nanotechnology.

But molecular nanotechnology itself moves in the opposite direction. It starts with small, precisely structured molecules, which people have been making for a hundred years or more through organic chemistry. And the challenge, rather than making things smaller, is to make things larger, while keeping that precise control.

So molecular nanotechnology is a bottom-up path. Conventional microtechnology, which has recently been relabeled with the sexy term nanotechnology, is a fundamentally different top-down path that I don't think leads to the same destination.

I see them as moving together on a size scale, and having some synergy. I can imagine hybrid systems for a time. But then the molecular approach, I believe, will displace the other, because of its advantages of precision, range of control, and cost. Nobody's ever suggested to me how anything else could substitute for it.

Molecular manufacturing, which is at the heart of molecular nanotechnology, will be based on the use of molecular machines that use molecules as building blocks to build complex structures.

Explain "molecular machines."

A conventional machine is a large collection of atoms with parts that move and do useful things. A molecular machine is one that has very few atoms, relatively speaking—thousands or millions or billions are typical numbers—and that has all its atoms in precisely defined locations as an aspect of its design and manufacture. So they're devices that have scales measured in nanometers instead of millimeters, which makes them roughly a factor of a million smaller than conventional mechanical devices.

The things that molecular machines do in biology include taking molecules and putting them together in complex patterns to make other molecular machines. A wide range of products—everything from protein molecules to redwood trees—is made by biological molecular machines.

Studying what could be done with artificial molecular machines led to the conclusion that they could be used to build better molecular machines that could be used to build better molecular machines that could be used to make—it's a slight exaggeration to say "anything that's physically possible by arranging atoms," but surely a much, much wider range of physical structures than can be made any other way.

In the 1970s, genetic engineering technology was just getting underway. This made it possible to synthesize, more conveniently than before, new protein molecules. Proteins serve as components of molecular machines in biology, and that meant that the problem was one of design. We had the tools to make building blocks for molecular machines; the challenge was to design them.

So in 1981 I published a paper in the *Proceedings of the National Academy of Sciences*, arguing that protein design was in fact feasible—many people at the time thought that it was impossible because of the complexity of different ways that a long, floppy molecule could fold up—and then presenting an analysis that indicated that with protein-based molecular machines, you could start this process of building better molecular machines, and eventually have very sophisticated molecular manufacturing systems.

And in fact in 1988, a protein molecule was successfully designed from scratch, by Bill DeGrado at DuPont. A number of groups have done likewise since.

Unfortunately, this work has not been done by people with a systems engineering perspective, and so little or no effort has gone into making building blocks for larger systems. It's been done by biologists and chemists, who are chiefly interested in studying natural systems by imitating them, with small differences, and in making devices that do what we see in nature, perhaps under different conditions.

For example, proteins have been engineered for

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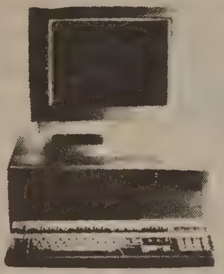

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greater stability, to enable them to sit in bottles of enzyme detergent on shelves in grocery stores for a long time.

So what do engineers contribute?

Engineers bring an understanding of the principle that a set of building blocks and a way of putting them together can be used to make systems of indefinitely large size and complexity.

We see in computers that knowing how to make a few kinds of transistors and connections between them is sufficient to make the most sophisticated supercomputers in the world, or at least the CPUs for them. We see in software that a few instructions in a RISC machine can be used to implement absolutely any computational process. And that understanding, applied to the molecular domain, can open a new world of engineering.

In some ways the development of molecular manufacturing will be like the development of the digital computer. Once upon a time, there were many different special-purpose devices for processing information—adding machines, and analog computers, and so on and so forth. Then there was the development of a general-purpose device for processing information that worked by handling information in what could be seen as its fundamental units—bits—performing repetitive operations in a controlled sequence at high speed, using smaller and smaller devices.

In conventional manufacturing today there is a wide range of special purpose devices—milling machines and lathes and injection molding machines and so forth—but what we can look forward to is the development of a general-purpose device that can make virtually anything by working with matter in terms of its smallest building blocks, atoms and molecules. And again, working at high speeds, using small devices performing simple repetitive operations in a controlled sequence.

What kinds of products and technologies might come out of this?

The easiest products to imagine just offer large performance improvements over ones that we already have. For example, we've seen computers for many years now become smaller and faster and more energy-efficient. With molecular manufacturing, it will be possible to make machines that are somewhat faster—billion-cycle-per-second clock rates—that are smaller than a bacterium, and consume so little power that a billion times the capacity of a modern supercomputer could be put in a desktop box and cooled with a fan. The reason that these devices are only somewhat faster than modern electronics is that this particular calculation is based on a simple mechanical scheme, a hybrid between Babbage's Analytical Engine *[laughs]*, modern VLSI architectures, and molecular components.

Ralph Merkle at Xerox PARC and I have been looking at electronic schemes for computation that would likewise exploit nanometer-scale components built with molecular precision.

Most of the work that Ralph and I have been doing, though, uses the standard computational modeling tools that chemists have developed to predict the behavior of the molecules they're working with, and applies those tools to describe large structures that are designed to work like macroscopic machine components. Things like robot arms in factories—for an example that's highly relevant to molecular manufacturing—have gears and bearings and a wide range of moving parts. So Ralph and I have designed a set of bearings with hundreds to thousands of atoms—the principles scale up to larger structures—and more recently have designed the first nanometer-scale planetary gear system, a device that has a shaft coming in one side spinning it at one speed, and a shaft coming out the other side that spins at a different speed, and transmits power from one to the other.

What might this gizmo be used for?

This particular device is primarily a demonstration of what can be designed and modeled with available tools. But planetary gears are found, in the macroscopic world, in automobile transmissions, and in nanometer-scale mechanical systems they can serve similar functions.

What separates the designing and modeling, which you can do with current molecular modeling technology, as I understand it, from the ability to actually build the things?

What we've been designing are things that can't be built with anything like today's tools. They can be modeled, in part, because they contain very few atoms and therefore are among the simplest mechanical devices that are possible in the physical world.

But to make them will require tools that can position very reactive molecules precisely in three-dimensional space, to build up these structures in more or less a building-block fashion. Those tools don't exist, but we can see how to go about developing them in a step-by-step fashion. It will take many years.

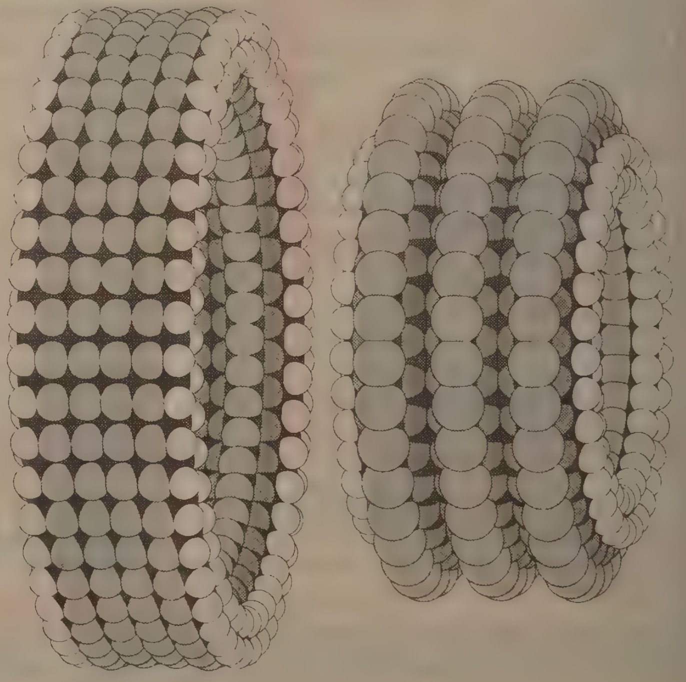
What is the current state of tools? It is now possible for people at IBM to line up a bunch of atoms to spell IBM. But as I understand it, this is done at very, very low temperatures, and when you get to room temperature the atoms go about their normal business... So this is transitory and expensive and not currently useful.

The next major step on the pathway that currently seems most attractive involves using a relative of the scanning tunneling microscope (which was what Don Eigler's group used at IBM Almaden), the atomic force microscope [AFM], as a positioning mechanism for reactive molecules, molecules that, when put in place, will form strong, stable bonds to their neighbors.

Markus Krummenacker, a researcher supported by the Institute for Molecular Manufacturing, is presently studying the design of molecular building blocks with those properties. And research is getting underway here in the Bay Area aimed directly at building an instrument able to position such building blocks, a descendant of the atomic force

Continued on page 179

> *"What we've been designing are things that can't be built with anything like today's tools. To make them will require tools that can position very reactive molecules precisely in three-dimensional space, to build up these structures in more or less a building-block fashion. Those tools don't exist, but we can see how to go about developing them in a step-by-step fashion. It will take many years."*



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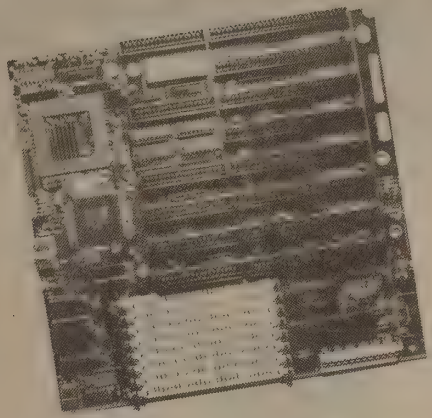

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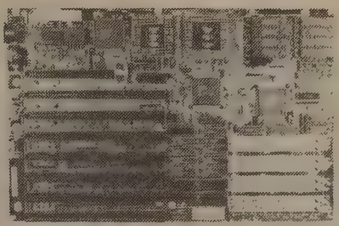
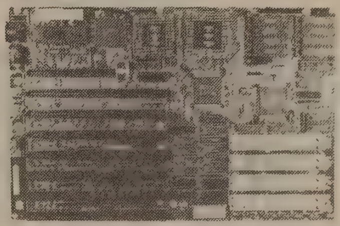


486DX-50(AT450)

CPU:80486-50
CHIPSET:SIS
CACHE:64/128/256/
512KB/1MB
BIOS:AMI
BOARD SIZE:BABY
SLOTS: 8

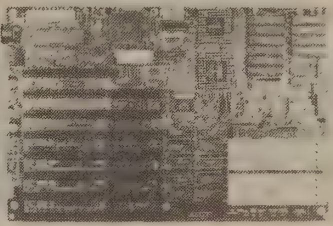


486DX-33;SX-25/ 20(AT433)

CPU:80486DX2-50/66
CHIPSET:SIS
CACHE:64/128/256/
512KB/1MB
BIOS:AMI
BOARD SIZE:BABY
SLOTS: 8

386DX-40/33/25(FU333)

CPU:80386-40/33/25
38605-40/33/25
CHIPSET:CHIPS AND TECH.
CACHE:64/128/256/
BIOS:AMI
BOARD SIZE:BABY
SLOTS: 8



386DX-33/25(FS333)

CPU:80386-40/33/25
CHIPSET:SIS
CACHE:64/128/256/
BIOS:AMI/AWARD
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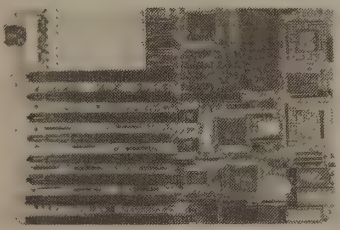
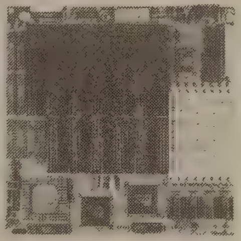
SLOTS: 8



486-50/33 EISA(AE4)

CPU:80486-50/33
CHIPSET:SIS
CACHE:64/128/256
BIOS:AWARD
BOARD SIZE:BABY
SLOTS: 8



486DX-50/33;486SX-25/20(AX4)

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CACHE:64/128/256/
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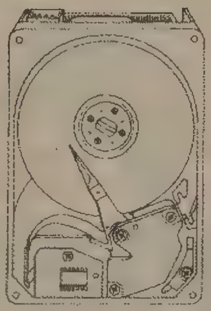

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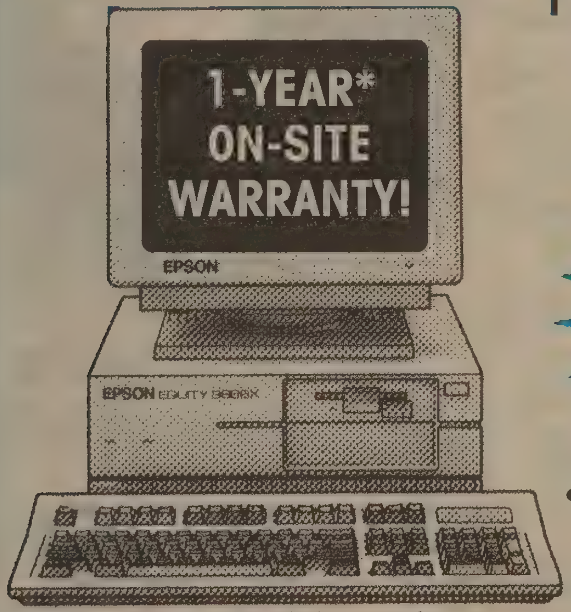
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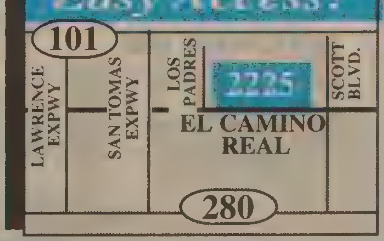
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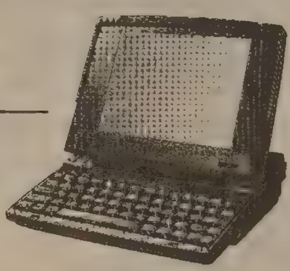

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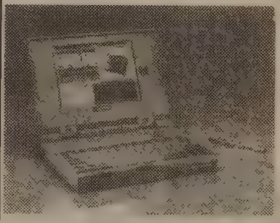

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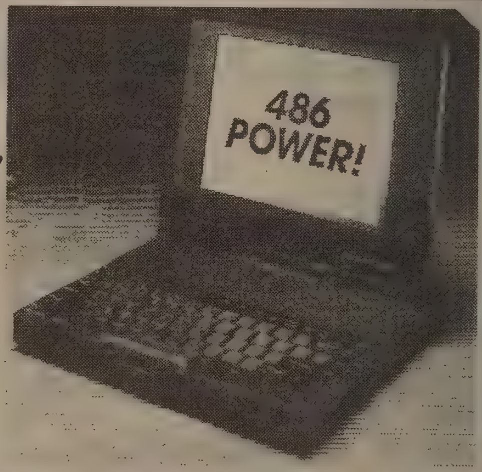

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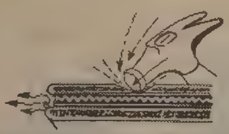

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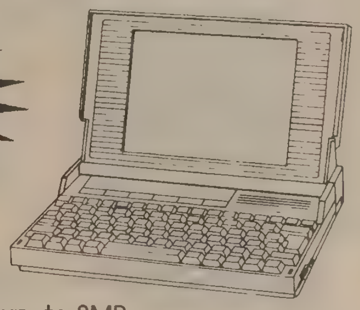

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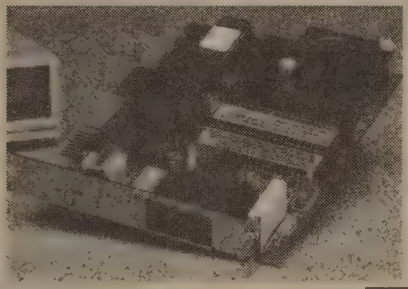

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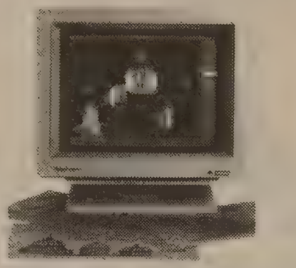

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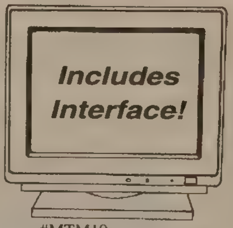
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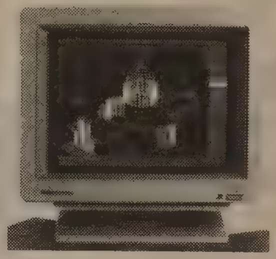

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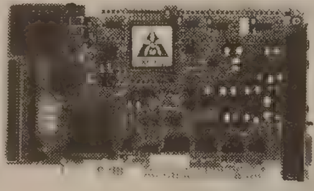

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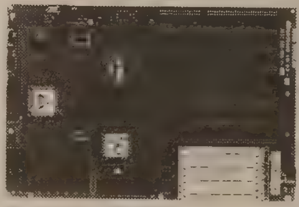

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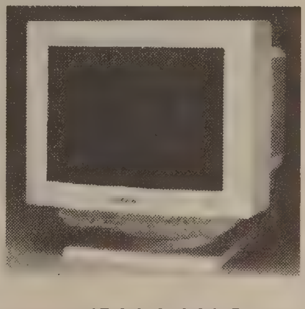

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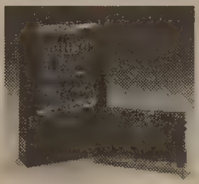

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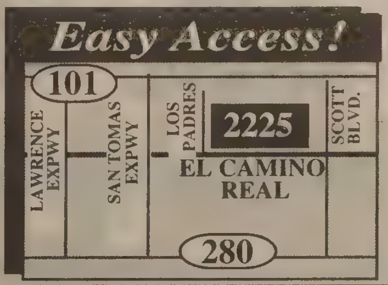

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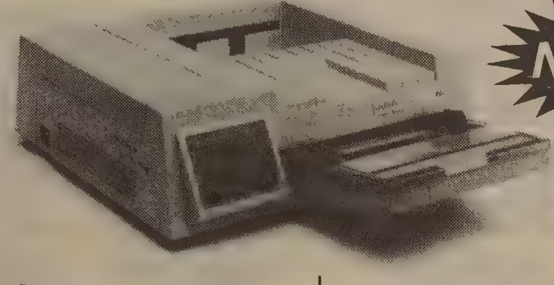

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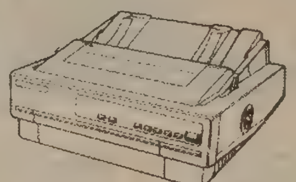

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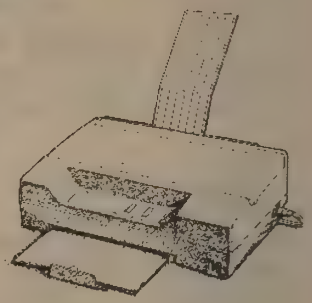

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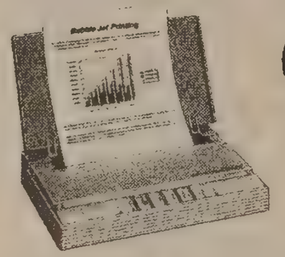

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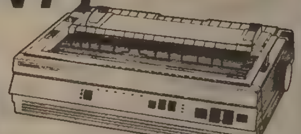

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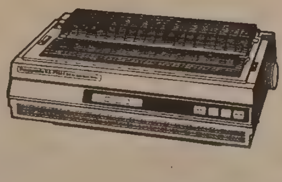

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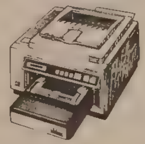

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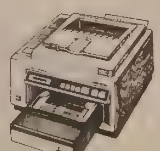

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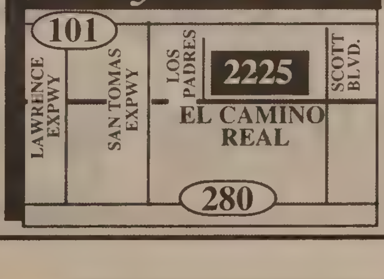

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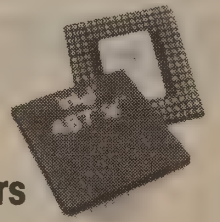

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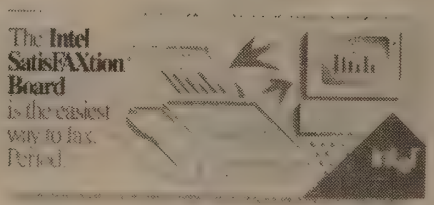
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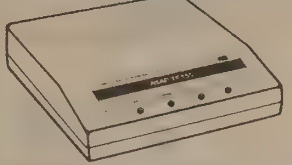

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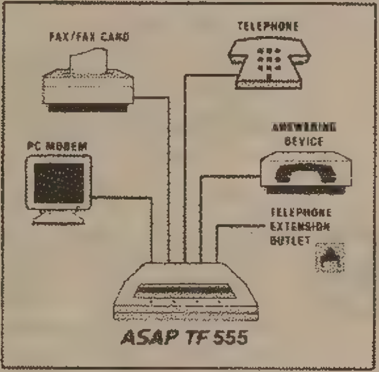

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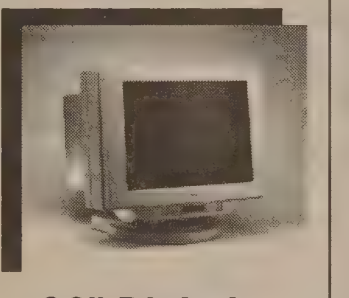

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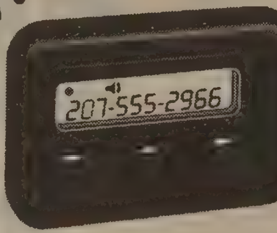

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Help Us Choose The Next MicroTimes 100!

Yes, dear readers, once again our January issue will feature our annual list of leaders and unsung heroes who played a key role in the personal computer industry in 1992. It's been another turbulent year, and we expect some more surprises before it's over.

As usual, we will have no great shortage of PR packets, annual reports, company backgrounders, and the like vying for our attention as we compile the list. But as usual, we'd like to see more of the picture, so we're calling on you for help.

Tell us who you think made a difference in the industry in 1992. They can be as well-known as Bill Gates, or unknown to the world at large. Tell us *why* you think we should put them on the list, what particular accomplishment makes them noteworthy. And please tell us where and how we can contact your nominee for more information.

We will give ten free one-year subscriptions to *MicroTimes* to randomly drawn respondents to this survey, so if you'd like to enter the drawing, please be sure to include your name and address at the end of this form.

In order to be considered, your nomination must be received in our Pleasant Hill office by 9 am on Monday, November 30. Nominations may be sent by US Mail, fax, or electronic mail.

Thanks for your help!

—eds.

Name of your nominee: ______________________________

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Why should this person be on the list for 1992?

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Commodore Announces Amiga 4000

First Of The Next-Generation Machines Offers New Power

BY DOUGLAS J NAKAKIHARA

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At the recent World of Commodore Amiga show in Pasadena, Commodore unveiled its newest and most powerful Amiga. The Amiga 4000 is the first to use the Advanced Graphic Architecture (or the AA) chip set, and features a new 8-bit HAM mode called HAM8. This allows the use of an incredible 256,000 simultaneous colors from a 24-bit palette (16.7 million colors). The A4000 also sports a new version of the operating system. This is one hot machine!

For the first time, the CPU, a 25MHz 68040, is mounted on a plug-in card installed in a 200-pin processor slot, in order to allow easy upgrades to faster and newer versions of the CPU. Interestingly, the card is the A3640, which also fits in the Amiga 3000T.

FEATURE OVERVIEW

The A4000 has four Amiga Zorro III slots, plus three PC/AT slots. As in the A3000, these slots run horizontally, and the video card slot is in line with one of the Amiga slots. This video slot configuration is exactly like that of the A3000. However, a NewTek representative has indicated that the Video Toaster will not function in the A4000, let alone fit inside.

The A4000 case looks like someone did a "morph" between an A3000 and an A2000, and got stuck in between. It has room for two 3.5" floppy drives and two hard disks. The front bay can hold a 5.25" device, a feature sorely missed on the A3000. Does this indicate the impending arrival of CD-ROM? Jim Dionne, president of Commodore USA, would not confirm this, but did say that Commodore was strongly committed to the CD-ROM technology for the entire Amiga line.

The keyboard, RS-232 serial, parallel, floppy drive, RGB video, and stereo audio jacks are all located on the back of the A4000. The mouse/joystick ports are on the left side. These things get moved with every new Amiga. It's the same old Amiga keyboard but it uses a new mini-connector plug.

The single video jack—there are two on the A3000—outputs horizontal scan rates of 15KHz–31KHz and vertical scan rates of 50Hz–72Hz. The spec sheet indicates that the A4000 requires a VGA or multiscan monitor; however, to utilize all of the display modes, you'll need a multiscan. A standard 1084 monitor will work, but you'll only get the original native display modes.

DCTV did not work with the prototype A4000 I tested, but Digital Creations says that it should work with the final production model; the Digital Creations line of genlocks should work, but a software upgrade might be necessary.

Surprisingly, there is no built-in SCSI controller! Instead, the A4000 supports an IDE disk controller, the MS-DOS current standard, with a generous 120MB hard drive. Obviously, if you need SCSI, you'll need to add a SCSI controller card. Most of the A4000s demonstrated at the show had Commodore's 2091 SCSI controller cards installed, and it was announced that a 32-bit SCSI II card should be available in early 1993.

The A4000 also features an official high-density floppy drive, capable of reading and writing 880K and 1.7MB disks. The drive can also be used on MS-DOS formatted disks using CrossDOS, now built into AmigaDOS. There are currently no plans to make these drives available to other Amiga models.

Like the A3000, the A4000 allows up to 18MB of 32-bit RAM on the motherboard (2MB of chip and 16MB fast). The base configuration comes with 2MB of chip and 4MB of fast RAM. However, unlike the A3000, the A4000 uses industry-standard SIMMs, which should be cheaper and more readily available than the A3000's ZIP chips. The RAM slots are located on the motherboard under the expansion board slots. The power supply has been increased to 150 watts from the A3000's 135 watts.

The Agnus and Denise custom chips have been replaced by Alice and Lisa. The new chips bring with them the new HAM8 mode. Fringing problems, common on standard HAM, are nearly nonexistent with HAM8 due to a larger base color palette. One demonstration showed a HAM8 animation running at 60 frames per second on a standard intuition screen. The demonstrator pulled the window down so we could peek at the Workbench screen—while the animation was running!

The A4000 can even display multiple resolutions at the same time. The AA chip set features the new Super72 modes, including an 800 x 600 resolution. It is worth noting that in current display modes the resolution restricts the number of maximum colors, while with the new model all the color modes are available in all of the resolutions. That means 256,000 colors in resolutions from 320 x 200 all the way up to 1280 x 400. Of course, overscan is available for all resolutions too! Non-HAM screens can display 256 unique colors.

The A4000 also features flicker-free interlaced modes without the need for a deinterlacing device. Everything is handled by the AA chip set. Each display mode is selectable, making all resolutions fully programmable. An additional display bit is even provided for genlocking capabilities.

The Paula chip remains basically un-

Continued on page 174

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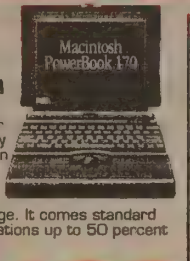

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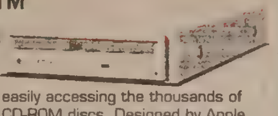

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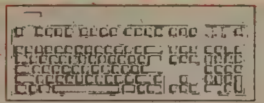

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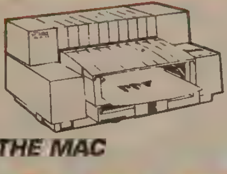

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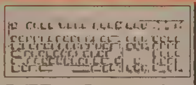

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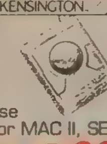

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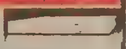

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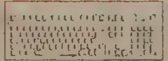

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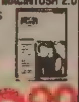

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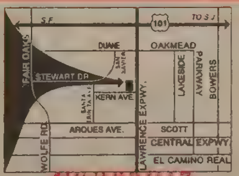

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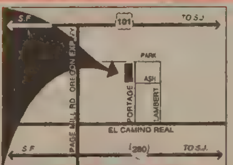

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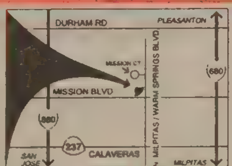

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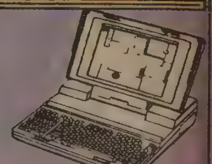

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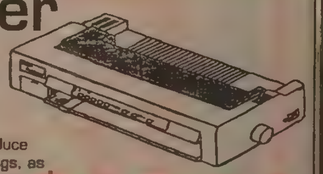

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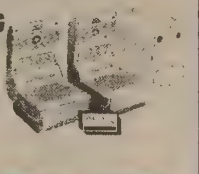

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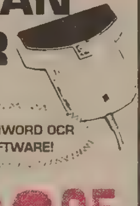

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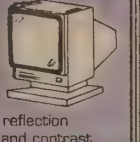

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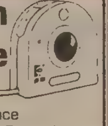

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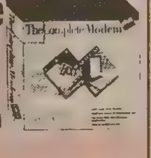

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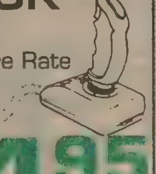

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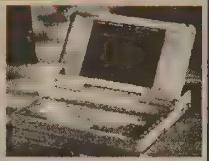

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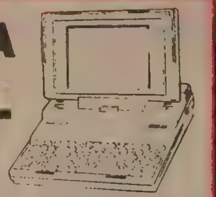

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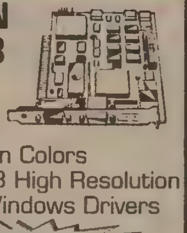

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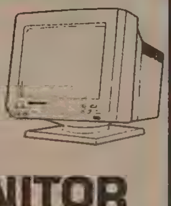

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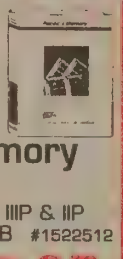

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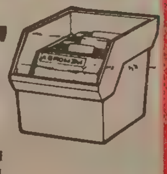

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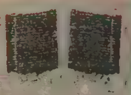

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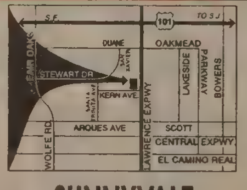
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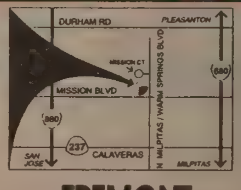
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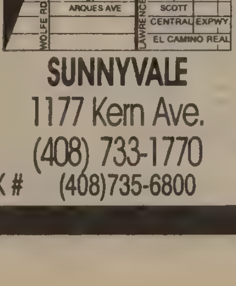
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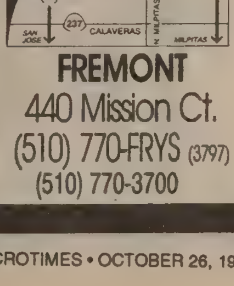
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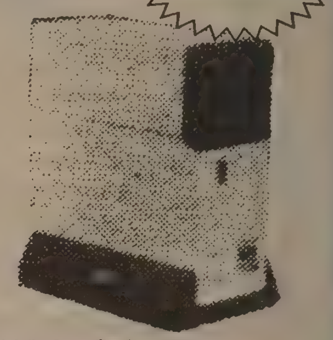

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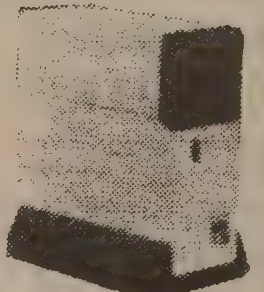

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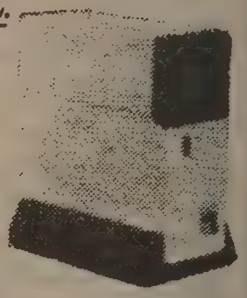

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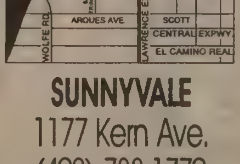
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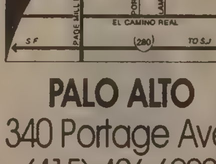
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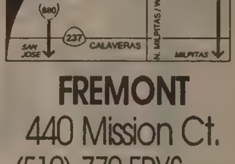
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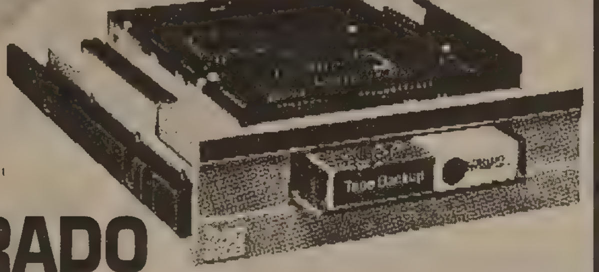

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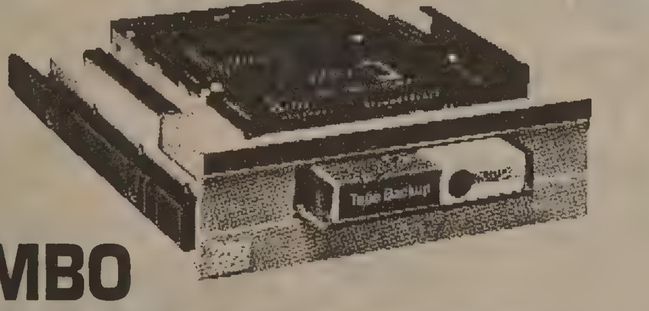

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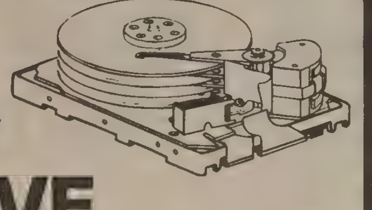

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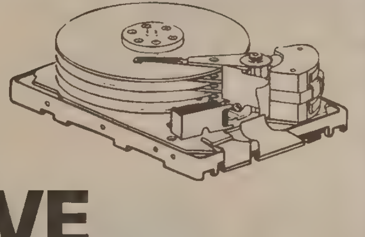

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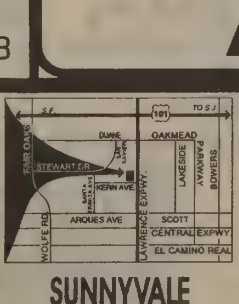
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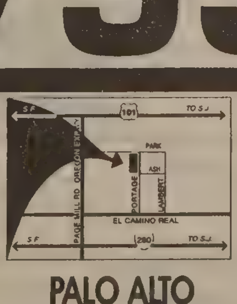
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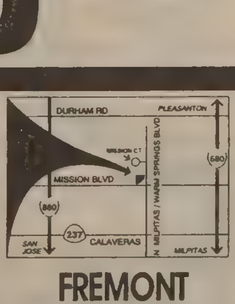
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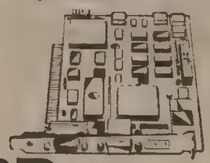

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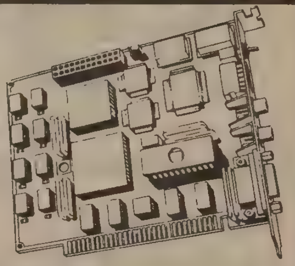

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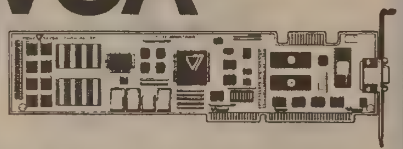

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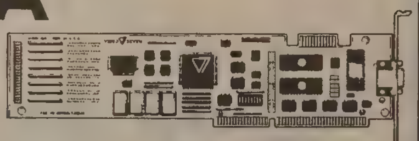

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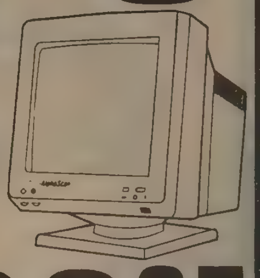

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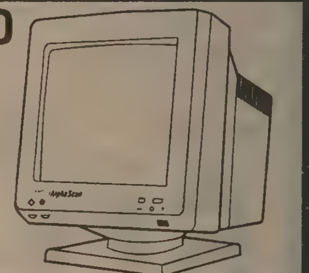

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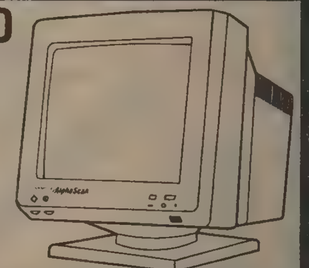

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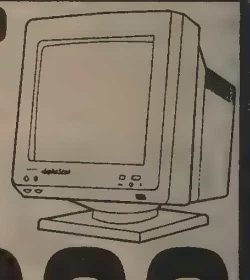

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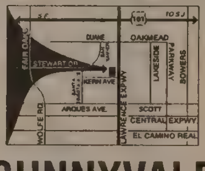
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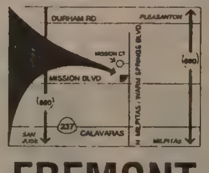
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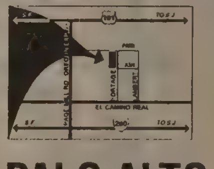
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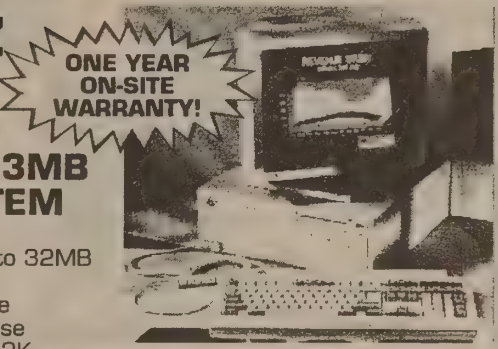

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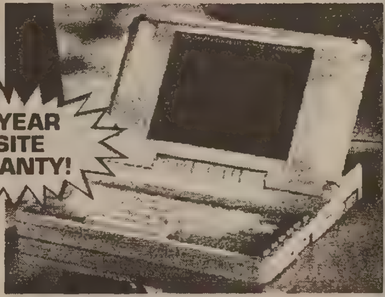

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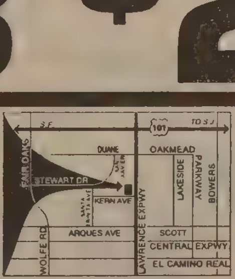
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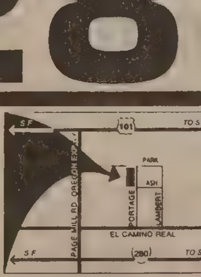
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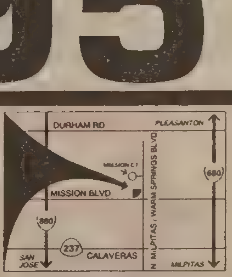
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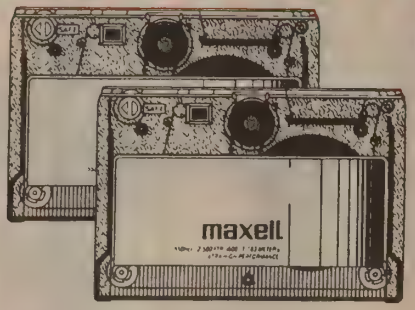

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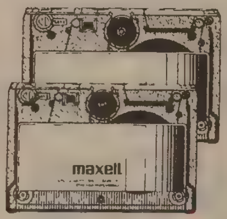

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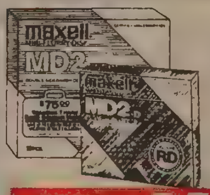
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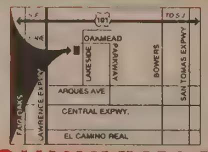
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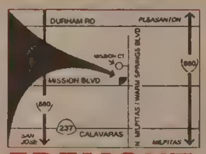
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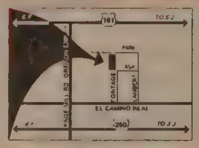
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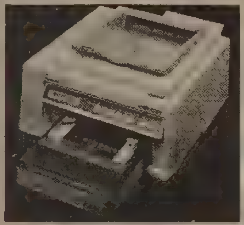

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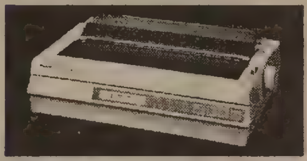

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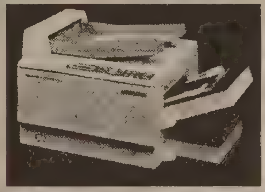

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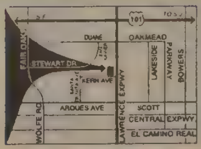

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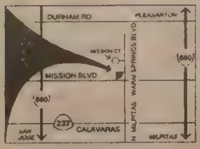

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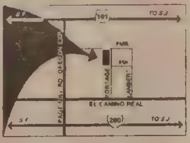

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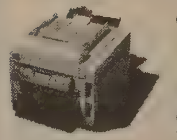

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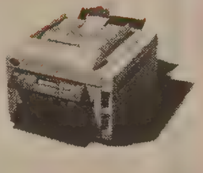

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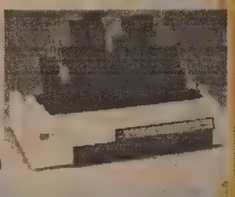

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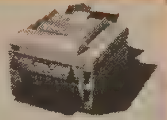

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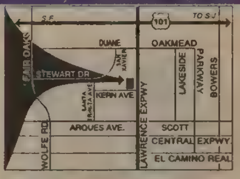

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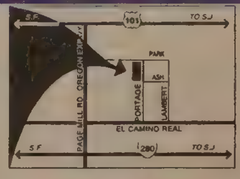

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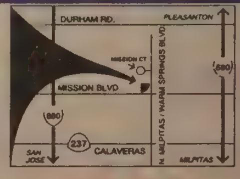

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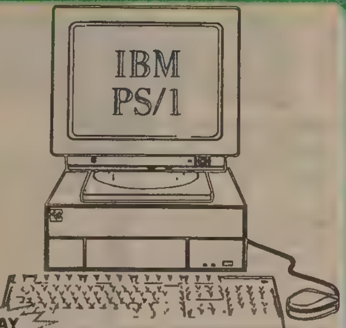

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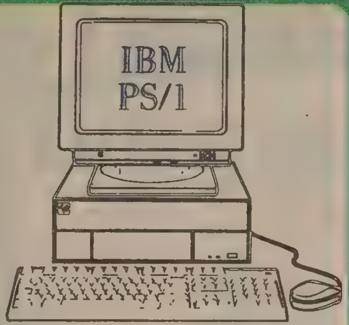

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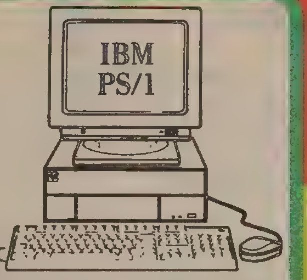

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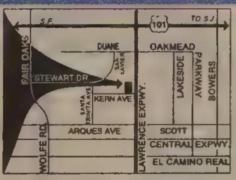

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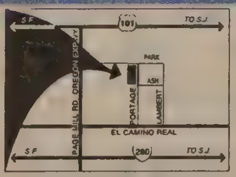

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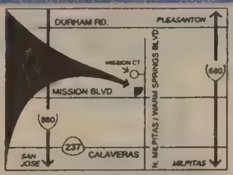

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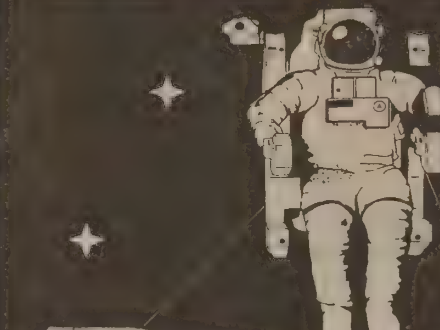

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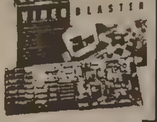

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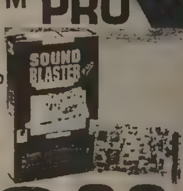

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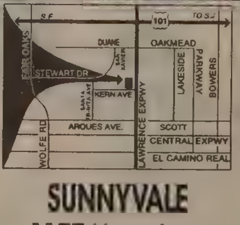

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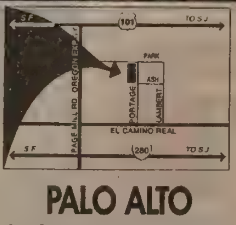

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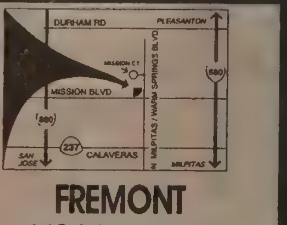

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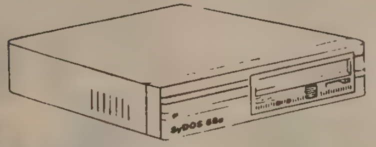

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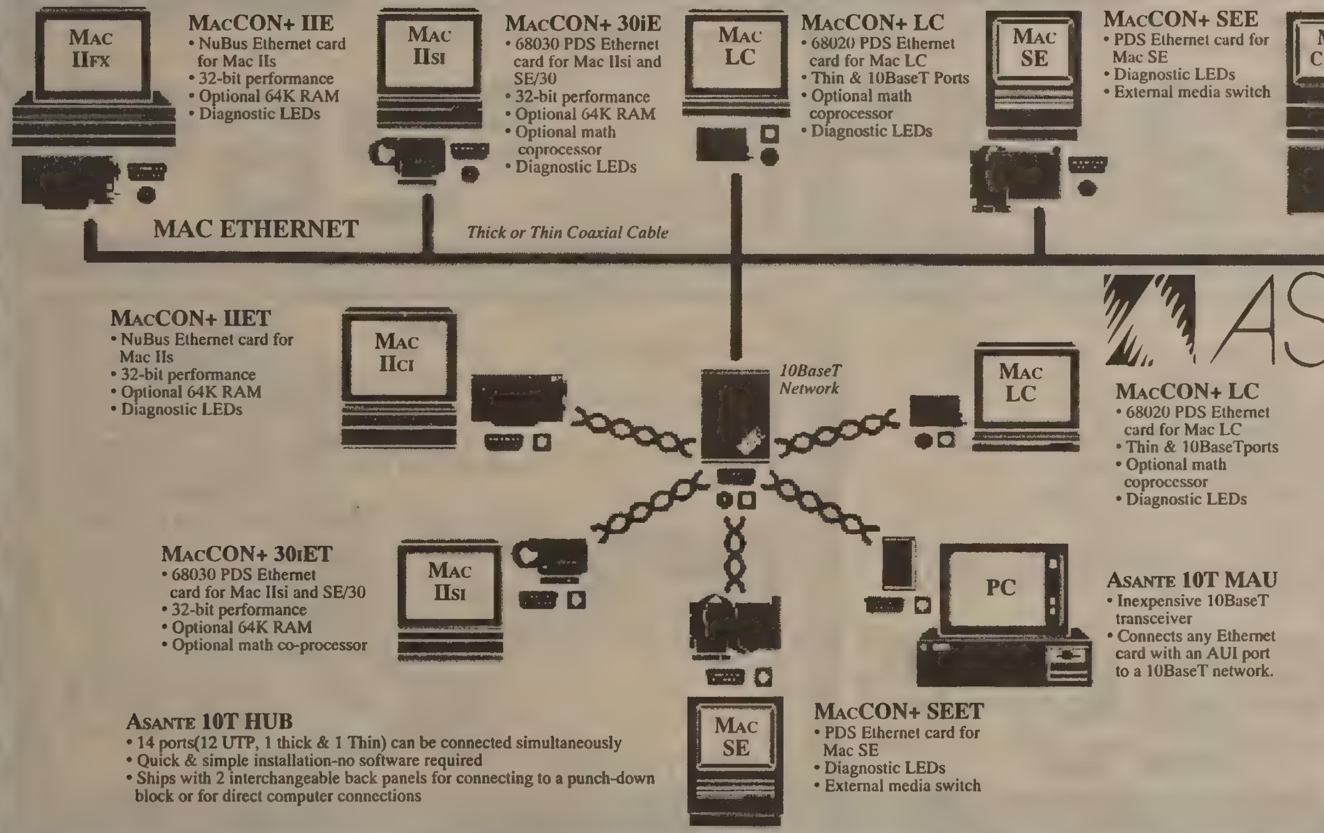
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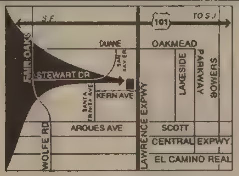
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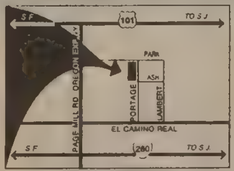
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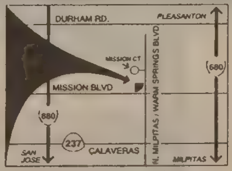
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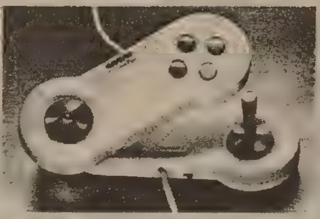

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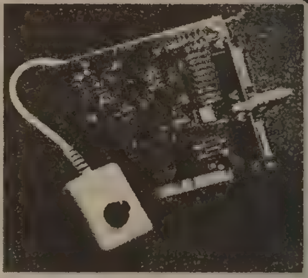

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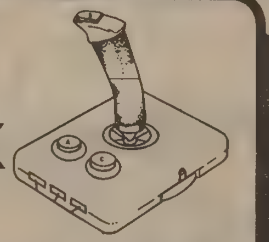

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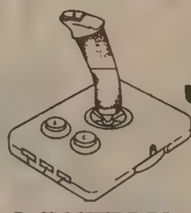

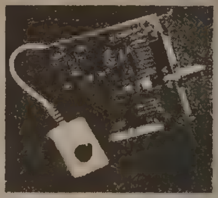

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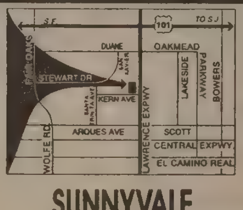

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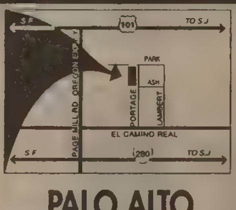

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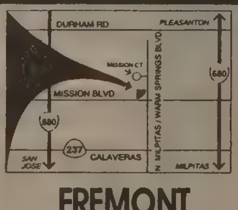

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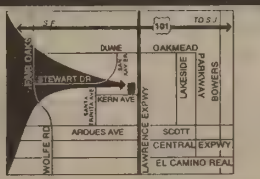
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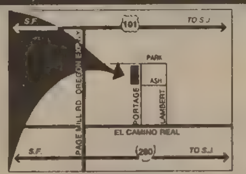
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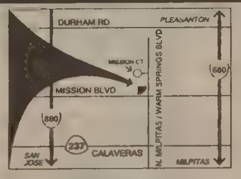
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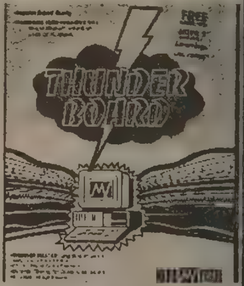
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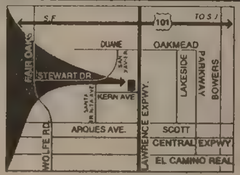
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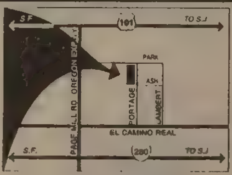
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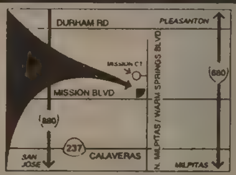
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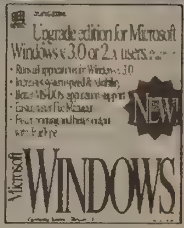
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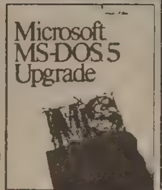
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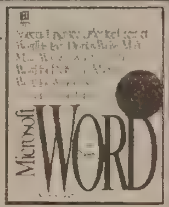
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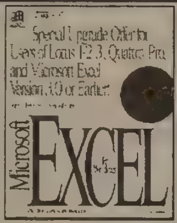
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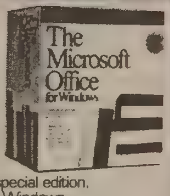
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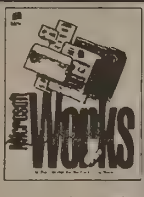
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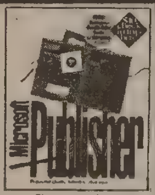
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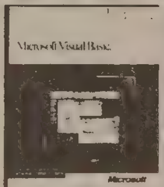
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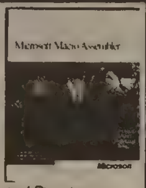
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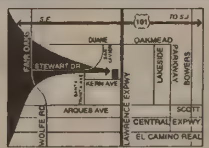
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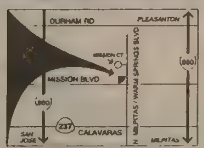
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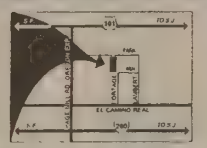
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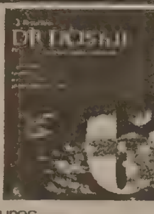

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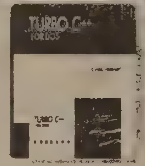

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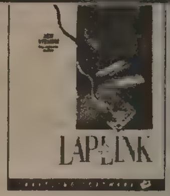

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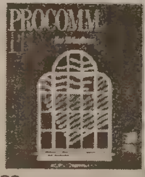

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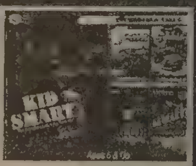

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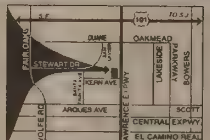

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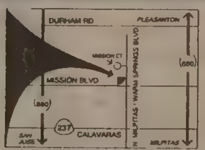

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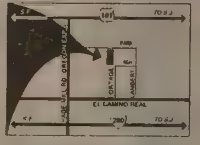

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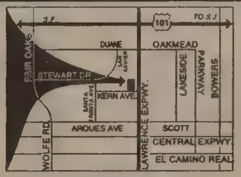

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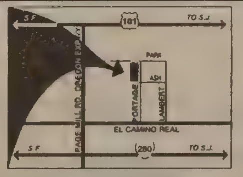

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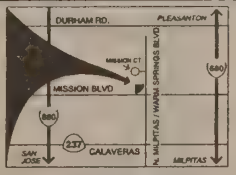

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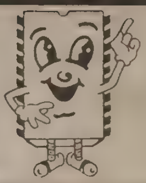

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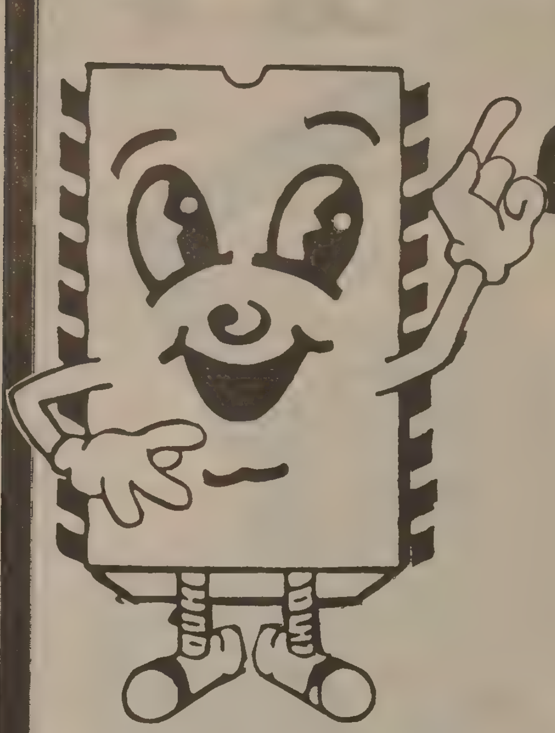

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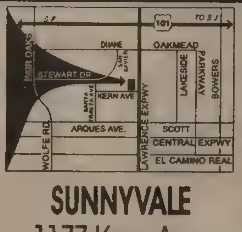
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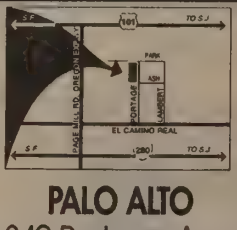
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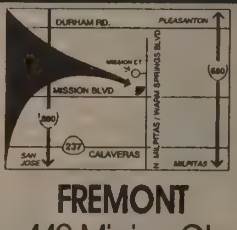
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The Amiga 4000 is the first to use the Advanced Graphic Architecture (or the AA) chip set, and features a new eight-bit HAM mode called HAM8.

Continued from page 150

changed, so audio is still 8-bit four-channel. It was hinted that Paula will be upgraded at some point in the future, and it appears that most of the custom chips are socketed for possible future upgrades. It should be noted that the A4000 has 32-bit wide access to all custom chips—not just the graphics chip as in the A3000—for a true, full 32-bit system architecture.

The A4000 comes with AmigaDOS 3.0, essentially the same as the upcoming v2.1, but taking advantage of the AA chip set. Programs that behave themselves under AmigaDOS 2.0 should have no compatibility problems with the new version. The new OS contains many new changes including greater customization of Workbench preferences and a PostScript printer driver. Kickstart appeared to be loaded into RAM; however, it's possible that this will change in the production model.

IMPACT

The Amiga market has been flooded with a plethora of third-party, 24-bit color add-ons, all taking their own approach. It remains to be seen what effect HAM8, now a de facto standard, will have on their sales. Of course some higher-end products feature greater resolutions, so those will probably continue to find a market. (If you are thinking 8-bit HAM isn't true 24-bit color, remember that a 640 x 400 screen only contains 256,000 pixels.)

Reaction to the A4000 was extremely positive. It will be interesting to see how, with a list price of only $3699, it affects the sales of A3000s, which list for only $320 less. Currently, the price difference is not an issue, because Commodore is offering a free CDTV with every A3000! One can only hazard a guess that a price adjustment for the A3000 may be near. Even forgetting the A4000's other advantages, you certainly can't buy an '040 accelerator for the '030-based A3000 for 300 bucks!

The only common complaint seems to be about the IDE controller. SCSI is much faster and more powerful since you can daisy-chain up to seven different devices. For various reasons, the IDE does make sense, however. First, most users are non-techies and will never miss the SCSI. Second, this probably shaved a few dollars off the A4000's production cost. Third, if someone wanted to add a second drive, IDE drives are much more readily available, and generally cheaper. Fourth, this gives Commodore some time to perfect its upcoming SCSI II card without holding up the release of the A4000.

This marks the beginning of a new era, since all future Amigas will be based on the AA chip set—in fact, the A4000 is reportedly the low-end model of a new line of Amigas.

What are current Amiga owners going to do? Based on what I've heard, it is unlikely that pre-A4000s could be upgraded to the AA chip set. The technology is just too different. However, Jim Dionne indicated that there will probably be a way for current Amiga owners to trade up to or get a price break on an A4000, as was done with the Amiga 2000 and 3000.

A tower version of the A4000 should be available sometime around March 1993. The new 2.1 operating system should be out in November. For current 2.0 users, this will be a simple floppy-based upgrade. Amigas should start shipping with 2.1 in a few months.

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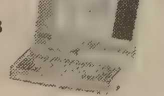

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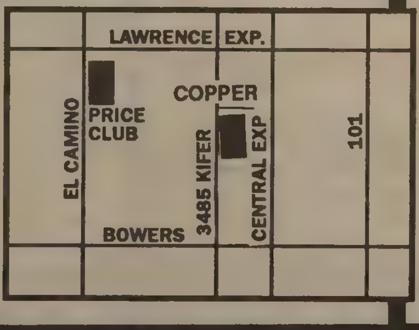

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OTHER PRODUCT ANNOUNCEMENTS

The much awaited A570 also debuted at the show. This turns an A500 into a CDTV unit capable of playing all CDTV titles, audio CDs, CD+G, and CD+MIDI discs. It also has room for 2MB of expansion RAM and provides a rear expansion slot for plug-in cartridges.

Commodore also showed the new A600 computer, a slimmed-down version of the A500, sans expansion slot, aimed directly at the home entertainment market. The A600 features a PCMCIA industry standard expansion connector. With its composite video port, it can be connected directly to a television. Initially, it will be bundled with a host of games. A hard drive version is also available, but will be bundled with more serious software, including a word processor.

Incidentally, Jim Dionne indicated that a CD-ROM drive for the A600 is under development. Also, David Archambault, director of business markets at Commodore USA, stated that while PCMCIA is not initially in the A4000, "the company has a commitment to putting PCMCIA in all of its products."

CDTV units were everywhere in the Commodore booth. Some were showing off the CDXL technology along with the new AVM display adapter, which combine to provide full-color, full-motion, quarter-screen animation straight from the CD. This is quite an achievement considering the notoriously slow transfer rates of CDs. On other PC platforms, people think it's great to achieve lesser performance using a hard drive. Kodak Photo CD compatibility is still in the negotiation phase; however, the software and hardware are ready. Incidentally, current Amiga owners can purchase a CDTV with an Amiga interface for $599.

COMMODORE'S AGGRESSIVE MARKETING

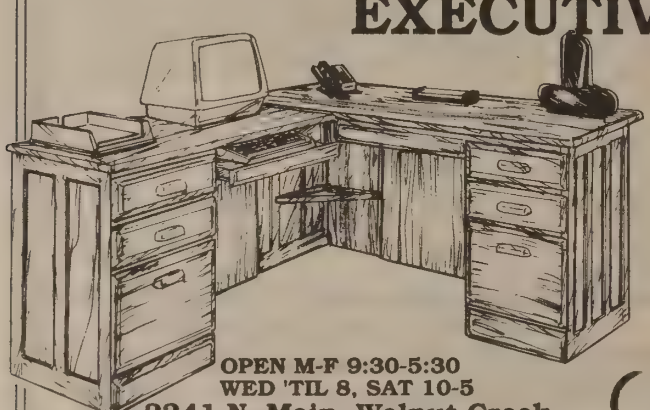
Commodore is serious about promoting the Amiga and has launched a major print ad campaign targeted at four key professional markets: videography, computer-based training, point-of-information kiosks, and dynamic presentation systems. This includes ads in traditional PC magazines like *BYTE* and *PC World.* One such ad, aimed at the MS-DOS multimedia platform, starts off with: "The MPC version of multimedia may cost more than ours. But it's harder to use and requires more equipment." Commodore knows that the Amiga does multimedia better than MPC, and they want to get the word out.

Commodore is also aggressively trying to increase the Amiga's availability. Jim Dionne revealed that the company is currently negotiating a couple of deals with national reseller chains. Apparently, resellers are interested in the Amiga's profit margin, which has been squeezed to almost nothing for MS-DOS machines.

DIGITAL MICRONICS

I have to mention Digital Micronics' new product, Digital EditMaster. This system provides full-motion JPEG technology, 30-frames-per-second video capture, real-time video display and recording, frame-by-frame recording, full-screen non-linear editing, and SMPTE time code support. Full support for the SunRize audio boards is also featured. JPEG compression is available in rates ranging from 15:1 to 70:1. Digital Micronics' demonstration had an Amiga 3000 grabbing and compressing frames from a video disk to a hard drive, decompressing the files, and then displaying the images on a big-screen TV—all of this on the fly and in real time!

DMI also showed its Vivid 24 graphics coprocessor board. This board, equipped with up to four coprocessors is capable of dramatically reducing things like 3-D rendering for programs written to support it.■



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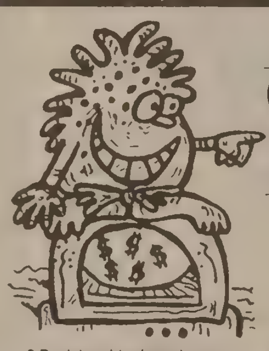

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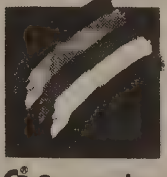

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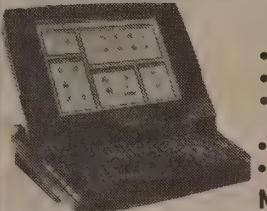

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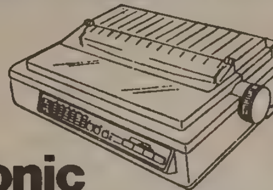

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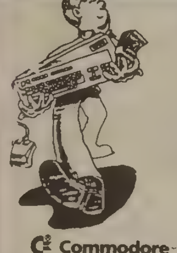

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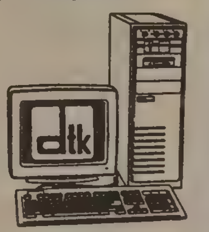

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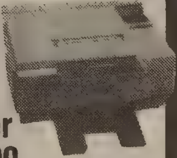

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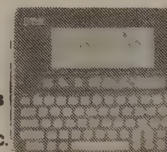

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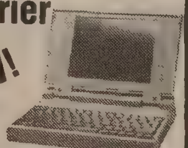

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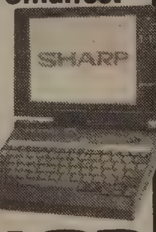

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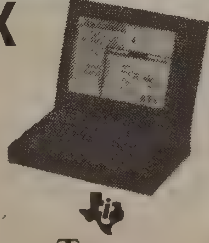

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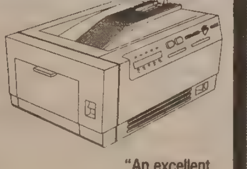

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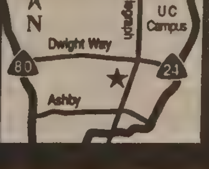

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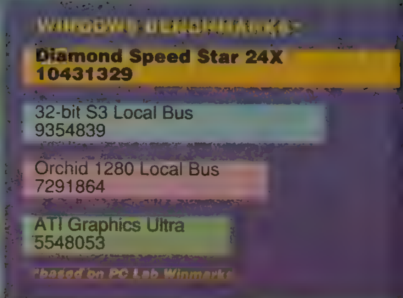

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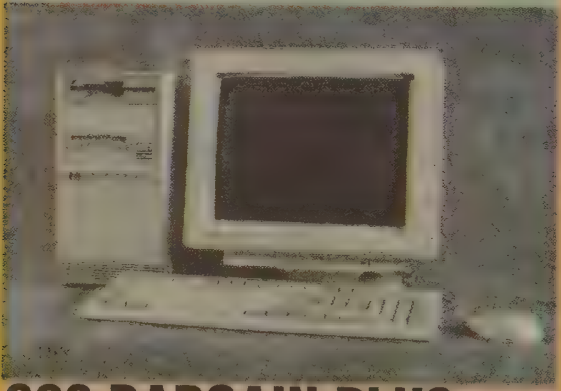

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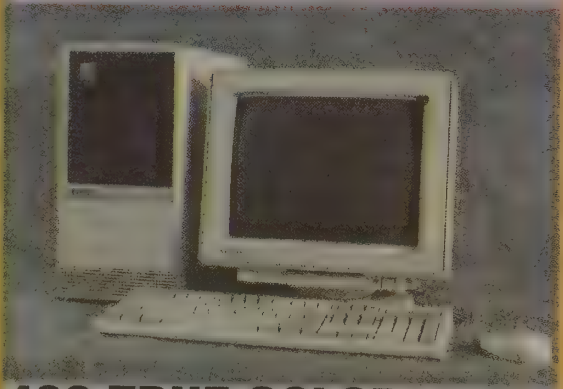

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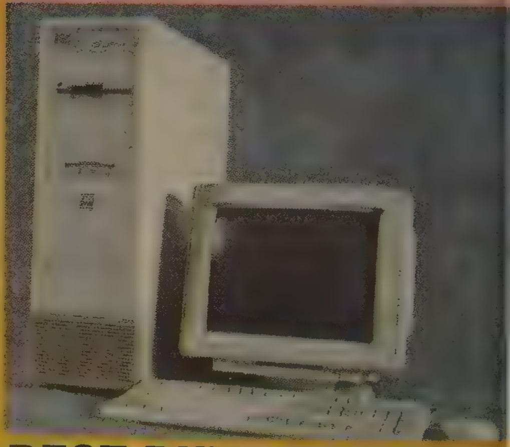

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Continued from page 134

microscope. This instrument, as planned, will be an adaptation of the atomic force microscope.

The atomic force microscope can act like a robot arm, able to position things in three degrees of freedom, not rotating, but X-Y-Z. What has been lacking is the functional equivalent of a hand at the end of the arm. It's like a robot arm that ends in a rough rock, rather than a selective gripper. A suitably attached protein molecule, in particular an antibody fragment, can serve as a selective gripper for other molecules.

This family of technologies can initially be used as an improved atomic force microscope—rather than bumping a blunt rough object against something to probe its shape, you can bump a sharp, precisely defined molecule against something to probe its shape, and can in fact probe it with several different tips, one after another.

This promises to be a powerful tool for biological studies, and for the pharmaceutical industry, as soon as it can be developed, and without building anything else. So that will, I believe, help to fund the development of the technology base, but that same instrument, by positioning reactive molecules, can build things. And the question is, what?

The first set of applications will be molecular instruments, made by building a complex molecular structure that's comparable in size to a protein molecule, or a set of protein molecules. That, for example, reads DNA—the DNA molecule binds, and feeds through the structure, and is destroyed one step at a time. If you can probe the DNA molecule as it goes by, so that you are reading out the sequence, you would have a molecular DNA reader. We know that molecules can read DNA, because that's how DNA is copied; the challenge is to build a device that reads DNA, and instead of producing a copy, produces, through a suitable interface, a pattern in computer memory.

This data could be used to learn about the molecular mechanisms of healthy tissue and of disease processes, and would be an aid in medical studies and pharmaceutical design, as well as in basic biology. If you can easily map all of the genes in a normal cell, then all of the genes in a cancer cell, you're going to more easily learn what the genetic changes were with that particular cancer. And from there, you'll have made at least a step in learning how to deal with it.

One of the scenarios in *Unbounding* is that of taking a pill of little nanomachines that attack only your cancer cells. How realistic is that? How do you separate the snake oil from the reality when you're at such an early stage? Some people would have it, for instance, that nanotechnology will enable us to live forever...

Well, first, it's clear that the ability to build sensors and medical instruments at a molecular scale, and to guide them using computers that are themselves smaller than a cell, will open a new world of medical capabilities. It will bring surgical control to a molecular level. What that can mean for treating disease is extremely broad. What it can mean for reversing the molecular and cellular changes of aging is also very broad.

But when people speak of immortality, they're speaking of something that can't be achieved within physical law as we understand it, because nothing is permanent and indestructible.

This spring I heard you say that when you first got interested in this, it seemed like a very, very long-term thing, and then relatively recently enough progress has been made to make you think that some of it, at least, is fairly short-term.

Over the years we've seen both an improvement in the technology base—the ability to make molecules and the ability to maneuver physical objects with subatomic precision. That's come out of laboratory work in the rest of the world.

In my own work over the last several years I have begun focusing on the question of the first steps. My initial studies were of long-term capabilities, which in many ways are simpler than first steps, in much the same way that digital logic is simpler than complex nonlinear transistor circuitry where you're paying attention to all the messiness of what's going on in those circuits.

Studies of those questions, taking advantage of recent developments in the technology base, indicate that there are impressive advances that can be made with something on the order of one year of laboratory effort, involving just a handful of people and relatively inexpensive equipment. And that there are a series of steps of increasing expense and difficulty as one builds more complex systems that lead from there to advanced molecular manufacturing of a wide range of products. With payoffs at every step along the way.

It appears that a first generation of scientific instruments based on improved atomic force microscopes can be developed in a time frame and cost range that is standard for venture capital. A few years, and a few million dollars.

Those instruments would then be very useful in biomedical research and pharmaceuticals, and would have a market that's substantial compared to that initial investment.

That same technology base, with moderate extensions, can be used to build complex molecular structures by positioning reactive molecules. Development can be rapid, because the time required to do an experiment to find out what's wrong with it and try again is short, on the order of a day. And the instruments required to do that are expected to be in the cost range of a high-end workstation. And so it's reasonable to expect that a wide range of moderately complex molecular mechanical devices can be built in a moderate length of time with a moderate development cost.

That range of devices includes a yet broader class of scientific instruments—I gave you the example earlier of a DNA reader. That's the most obvious one, and I suspect that as we get closer to that time and look more closely, a wider range of molecular scale instruments will appear attractive.

The reason for focusing on scientific instruments is that the value of information is independent of the size of the mechanism that produces it. Information about molecules that are found in the human body or that are used in industry in the million-ton-per-year range can be very valuable, even if that information was gained by studying just one molecule. So building a single molecular instrument can yield information that's worth thousands, millions, in some instances billions of dollars.

Pursuing that development path leads to a technology base able to build fairly complex molecular machines. Design analysis indicates that a mechanism with roughly one hundred moving parts is complex enough that with broadcast acoustic instructions to make it step through a series of states, it could be used much as the AFM mechanism could be used, as a construction mechanism, to build things. And since it itself would have been built by the AFM mechanism, one of the kinds of things it could build is more devices of the same sort.

At that point, you're in a position to make products from chemicals that have some cost that doesn't look ridiculous when expressed in dollars per gram, and is extremely small when expressed in dollars per molecule, since there are many billions of billions of typical molecules in a gram. At a thousand dollars per gram, you're talking about much less than a nanodollar per molecule. *[laughs]*

If you can produce complex structures from those building blocks for that kind of cost per gram, the cost per device is many orders of magnitude smaller than what is possible with semiconductor lithography and the integrated circuit technology on which computer electronics is based.

At that point it's reasonable to expect that someone will design devices that can serve as RAM storage cells, and will do the engineering work necessary to build RAM systems in which these molecular devices serve as storage cells. At that point a reasonable thing to anticipate is memory devices that use a semiconductor chip as an addressing mechanism, and a layer of repetitive molecular devices on top of that—a slab consisting of many layers of molecular devices on top of that, such that bits could be read from any of the molecular blocks on the interior of the slab. We're not talking a few atoms, or a few thousand atoms, but perhaps a few million per block.

Nonetheless, reasonable storage capacities for a device like that are in excess of 10^{15} bits in a chip-size package.

Compare that to what's currently available, or planned.

There is talk today of billion-bit chips. This would be a million times that capacity. And it's possible to do much, much better than that. What I described is a sketch of what one might see as an early-generation hybrid system.

The direction from there leads to building larger and more complex structures with molecular precision, including CPUs, and denser memory systems that are not limited by addressing through a chip, but instead have all of the required devices implemented on the molecular scale.

And at that point the hardware technology base for computers has been replaced, and we're clearly speaking of a many-billion-dollar world-class industry. In that same time frame, a wide range of other applications can be expected, but I think that example is sufficient to show the scale.

What time frame do you think that's likely to be? Two years? Five years? Twenty years?

Dates are difficult to estimate. It's much easier to calculate a good approximation to the behavior of a molecule than it is to make even a rough estimate of what a world full of researchers will do over a span of years when they're developing new tools and pursuing diverse goals.

But keeping that in mind, it is easy to see how to get a first-generation molecular manipulator with what a number of laboratory researchers have independently told me looks like a few months of work, for a crude prototype that demonstrates the principles. Developing that into a capable system and learning to use that well for molecular construction might take five years. At that point it's plausible that you could make machines with a hundred moving parts.

With machines with a hundred moving parts, you can now build a molecular-scale device, a hundred-nanometer-scale (tenth-micron-scale) device that is doing molecular construction, and you're in a position to begin a multi-year development effort that leads to making macroscopic quantities of increasingly complex products.

To reach the threshold of advanced molecular manufacturing, able to build a very wide range of kinds of materials and structures, will require another layer of advances on top of that. Again with fast, inexpensive experiments at each step along these paths, it's plausible that another five years, with at the later dates large resources being poured into what is already a very useful technology, could lead to these kinds of advanced results.

If you add up that sequence of steps, it adds up to fifteen years, but I wouldn't place any great confidence on that number.

Where do computers as we currently know them fit in with this, as tools or otherwise?

Microcomputers are used to control scanning tunneling microscopes and atomic force microscopes, to capture the data from them, to process that data into images. Increasingly in coming years, I would expect to see more powerful computer capabilities being applied to the interpretation of those images.

That will be important as molecular nanotechnology is developed, because the cycle of experimentation will involve trying to perform an operation and then probing the product with the point to determine what happened. Software for very rapidly and reliably interpreting those images will play a major role.

The other major application is in molecular CAD. Ralph Merkle has been developing software that can be used together with the chemists' standard modeling packages to help design the structures that the other package models, and at this point he has quite a long wish list of capabilities that they're beginning to work on.

What is the distinction between designing and modeling?

In molecular design you decide what atoms go where, what is the pattern of atoms and bonds that makes the shape that makes the structure of the component. In modeling you take that design, which is basically just a drawing—and then you turn on physics, or at least you turn on an approximation to the physics of real molecules, and as a result things move around, it all relaxes to a minimum-energy state. In other applications of modeling you can turn on thermal motion, and now the atoms move around subject to the forces that approximate the ones they would experience in a real molecule, so you can watch the dynamical behavior of the system.

So this is in a sense mechanical engineering on a completely different scale from what we're used to.

This is *precisely* mechanical engineering, in which something like finite-element approaches come naturally because there are a distinct number of atoms, though it's mathematically rather different from finite-element analysis.

One thing I've picked up over the last few months is that all this molecule-manipulating is happening at very cold temperatures, and once you get to something like room temperature all the molecules go on about their usual business. So how do you deal with things like turning off heat? How do you isolate what you want to do?

That's a set of questions that has different answers in different contexts. The first in a long series of steps will involve having a lot of stray molecules around that you don't want, having all the problems that chemists have with choosing molecules that will react and trying to surround them by others that won't react if they're not supposed to.

Today, chemists successfully make things by what is the equivalent of throwing parts in a box and shaking. What these AFM-based molecular manipulators will provide is the equivalent of a hand to put parts together. You'll still have other parts shaking around, but you'll add to the process a hand. There are a lot of limits to what you can do with that, but it's a big advance over where we are.

At the end of a long development pathway, what is described in *Nanosystems* is macroscopic systems that have a gas-tight wall around them. There are no stray molecules inside; the only molecules inside are ones that were brought in there after several steps of sorting and testing. They're bound firmly, and they go where you want them to, subject to only very small deviations due to thermal vibration. They can't wander, they can only vibrate within a small range, and that range can be small enough that they end up where you want them.

This is at the end of a long series of developments. This is where you are many years from now with a lot of work.

In one of your papers you talk about how there is not, at this point, a formal academic discipline called nanotechnology, and you talk about what somebody can study at this time to acquire a good background in the field.

I would say that some of the more relevant standard academic backgrounds are in physics, chemistry, mechanical engineering, and computer sci-

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ence. Molecular biology has some substantial relevance, particularly if there's been a focus on the molecular mechanisms involved. A lot of molecular biology is at some remove of abstraction from the nuts-and-bolts physical level.

I just spent 4 1/2 years working on *Nanosystems,* and giving it the content that it has, for the purpose of enabling people with backgrounds in those areas to learn what is necessary to analyze and design molecular machine systems, or to develop software to aid in design and analysis, or to gain enough understanding of their capabilities that it's possible to think more concretely about what can be done with them. My hope is that that will be useful for people who are interested in working in the field.

Molecular nanotechnology is a strongly interdisciplinary field. The fundamental interactions are chemical, but they need to be analyzed in a way that has more in common with the way physicists think of things than the way most chemists think of things. But the systems to be built, and therefore much of the analysis of what kinds of things to design, are primarily a matter of mechanical engineering.

This has led to two problems in the academic world. In the United States at least, chemistry, including synthetic organic chemistry, which is about making new molecules, isn't taught as a kind of manufacturing, or indeed as any branch of engineering and construction; it's instead taught as a natural science. At the University of Tokyo, in contrast, the Department of Synthetic Chemistry is in the school of engineering.

So this is an engineering discipline which is founded on the molecular sciences, but people in the molecular sciences, by and large, do not know how to think as engineers. Some do, but it's far outside the mainstream of the culture. That has led to difficulties.

And also, deeply rooted in chemistry as practiced today is the assumption that molecules are small and that they move around freely and run into each other in all possible positions and orientations, and that if a reaction is possible in any of those positions and orientations, it will happen. That tremendously limits the building blocks you can use and what you can do with them. A physical system in which those same molecules move in a controlled way and only encounter each other as planned, and can then be pushed together—that seemingly simple change upsets a tremendous number of usually unexamined assumptions in the field, even though there is nothing fundamentally novel about it in a scientific sense. And that's led to a whole pattern of superficial misconceptions.

For example, looking at a proposed structure and saying, "That structure is unstable." What's often meant is, "If that structure were to run into another identical structure in a particular position and orientation, then those two copies of the same structure would react." That doesn't arise in the context of advanced molecular machine systems, and in that context such a structure is stable. But a quick glance would suggest to a practicing chemist that whoever

Continued on page 220

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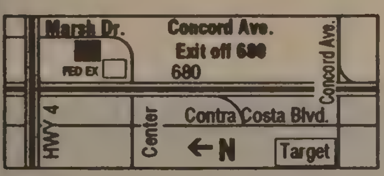

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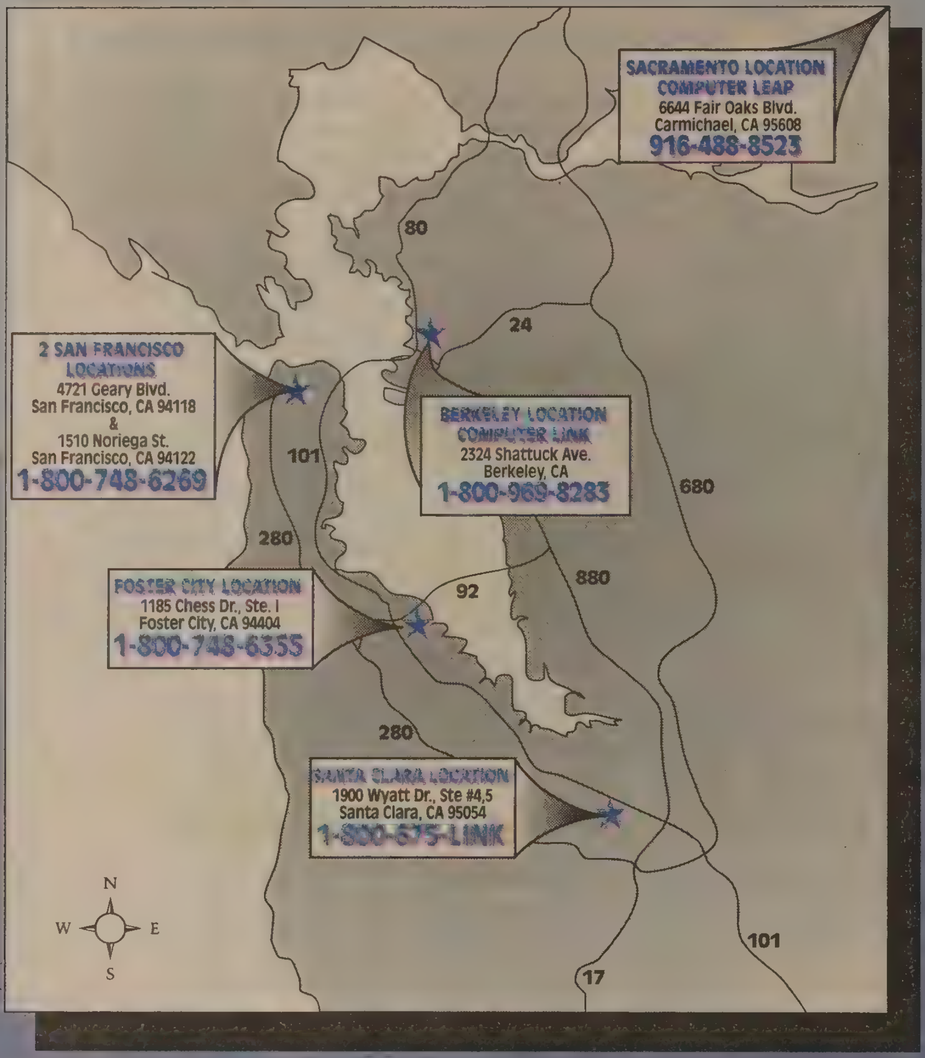
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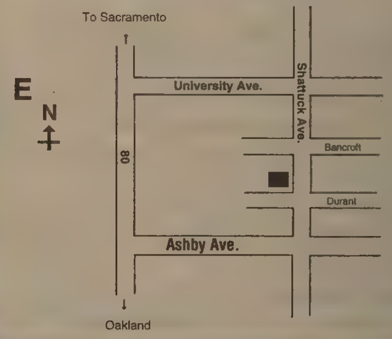
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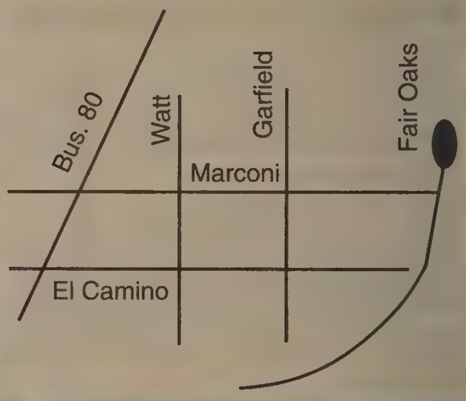
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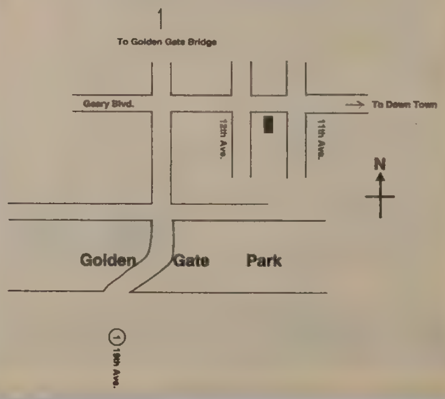
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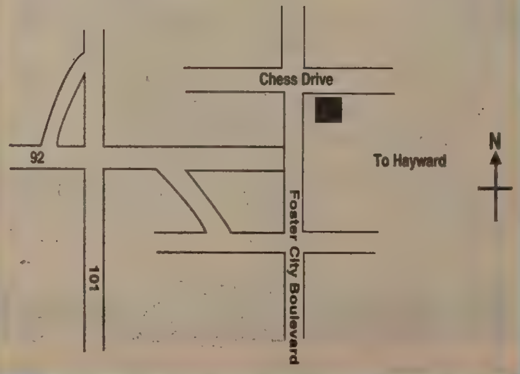
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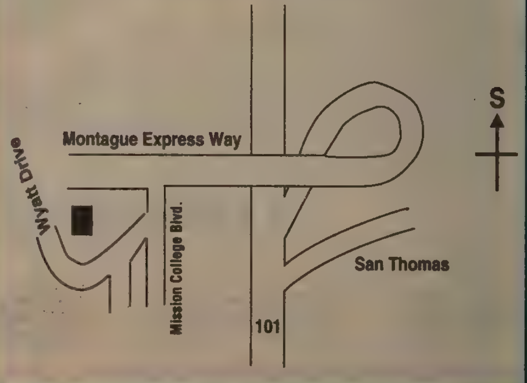
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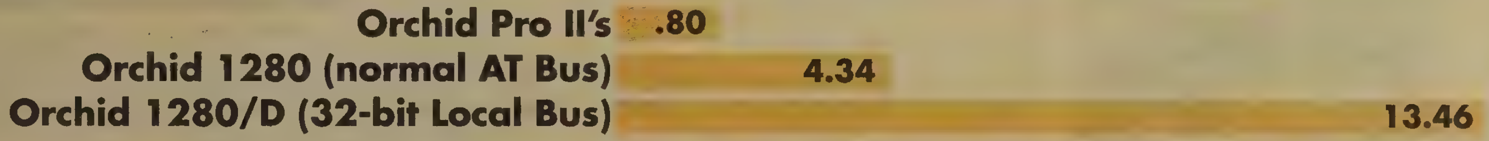

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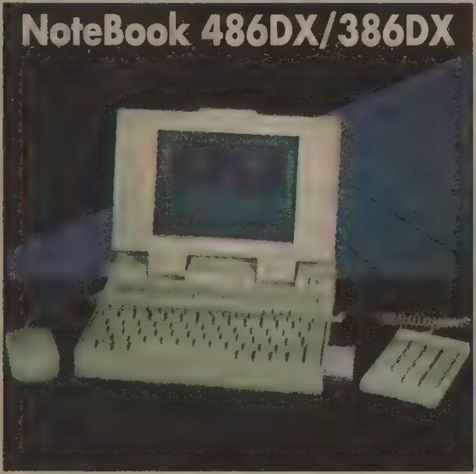

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Your First Computer

So You Wanna Buy A Portable

Some Things To Know Before You Buy

BY MIKE MARKOWITZ

A book of Verses underneath the bough,
A loaf of Bread, a Jug of Wine,
And a portable 25 MHz 32-bit computer with
8 MB RAM and an 80 MB hard drive,
Beside me, running in the Wilderness;
Ah, Wilderness were Paradise....

Most of our not-so-distant ancestors were born, lived their whole lives, died, and were buried within a few miles of the same village hut. With a heavy iron ploughshare for Dad and a big iron cooking pot for Mom, a pre-industrial family was considered affluent.

Today we need a lot more stuff to be happy, and to be truly happy we need to be able to carry it around wherever we go. In the 18th century, the pocket watch was developed as a portable, high-tech version of the table-top clock. Carrying a pocket watch was a stylish way to proclaim that your time was valuable. Today, carrying a computer is a stylish way to proclaim that your data is valuable.

A LITTLE HISTORY

The ancestors of the portable computer include the pocket calculator, the portable TTY terminal, and the portable TV. The Radio Shack Model 100 was one of the first useful battery-operated computers. It had a tiny display, no disk drive, and a non-standard operating system, but it had a built-in modem, and was very handy for journalists.

Apple's failure to develop a battery-powered Apple II ensured that MS-DOS computers would dominate the laptop portable market in the mid-'80s. IBM's sluggish product development cycle and uninspired engineering have never quite managed to produce a successful portable, leaving a market niche for companies like Compaq and Zenith. The rugged (and very expensive) portables developed by GRiD Systems, Inc. pushed the state-of-the-art, but the real market breakthrough came from Toshiba's line of compact, well-supported, and relatively affordable systems. The subsequent evolution of the MS-DOS portable has been the typical story—steady incremental improvements in performance and rapid reductions in cost, driven by fierce competition.

Today, top-of-the-line portables are more frequently using "active matrix" displays, which are very sharp and fast, but so expensive that the display may represent more than half the cost of the system.

Overall, portables represent about 15% of the personal computer market; some forecasters predict that this slice will grow to 40% over the next few years. In the last three years (according to *Fortune* magazine), the laptop and notebook computer market has become a $5 billion-a-year industry.

After a rocky start with the 16-pound Mac Portable in 1989, Apple finally developed a successful battery-operated Macintosh with the PowerBook series, introduced in 1991.

A GUIDE TO THE ZOO

A rough classification of portable computers has emerged, but the market is so diverse that you can easily find systems that do not fit neatly into any category.

- **"Palmtop"** or subcompact computers generally weigh two pounds or less, and may fit into a large pocket. This rules out a built-in floppy disk drive, and imposes severe constraints on screen and keyboard size. The Hewlett-Packard HP95LX series, which evolved from a long line of programmable scientific calculators, is an example. At the lower end, palmtops shade off into the category of personal electronic organizers, like the Sharp Wizard.
- A **Notebook** computer fits the dimensions of a sheet of paper (8 1/2 by 11 inches), with an upper weight limit around seven pounds. An emerging "sub-notebook" category includes systems slimmed down to about four pounds.
- A **Laptop** computer may be bigger than a notebook, but should still fit inside a briefcase, and weigh no more than about 12 pounds.
- A **Transportable** (or Luggable, or Lunchbox) computer is usually not battery operated, and may weigh 20 pounds or more. It should have a handle and fold up into a package that will fit under an airline seat. One advantage of such systems is presence of expansion slots.

Engineering is always a matter of tradeoffs between cost and performance. For any computer, the major performance parameters include processor capacity (16-bit, 32-bit, or some hybrid) processor speed (measured in MHz), memory and storage (measured in megabytes). For a portable computer, there are additional design tradeoffs involving battery life, size, weight, and display quality.

WHAT YOU SEE...

The greatest engineering design challenge in making a computer portable has always been the display screen.

Early portable computers like the Osborne, Kaypro and the first Compaqs tried to pack a miniature cathode ray tube into a ruggedized case. This made for a sharp, bright display at the cost of weight and bulk, plus the disad-

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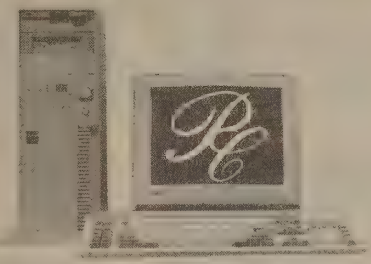

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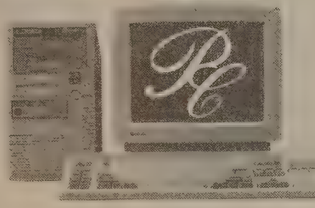

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vantage of being tethered to a power cord plugged into an electric socket.

The development of the LCD (liquid crystal display) made the battery-operated computer possible. Liquid crystals are made up of exotic molecules whose light-reflecting properties are reversed by the application of a tiny electric current, so a transparent spot becomes dark or vice versa.

A plasma display is very compact, relatively simple to manufacture, and provides bright yellow-orange type on a black background. But it draws so much current that battery power is ruled out. A liquid-crystal display requires very little power, but it responds sluggishly, and you need to add backlighting if you want to use it under less than ideal conditions; which increases your cost and power requirements.

Today, top-of-the-line portables are more frequently using "active matrix" displays, which are very sharp and fast, but so expensive that the display may represent more than half the cost of the system. Color flat-panel displays, which were only found in $5-10,000 systems two years ago, are beginning to show up in the $2-3000 price range—still beyond the reach of casual users. A reasonable compromise is the gray-scale display, which refines the basic monochrome LCD technology to simulate sixteen or more shades of gray.

CHARGE ME UP

Consider the humble battery. The most popular battery technology for current portables is nickel-cadmium (NiCad™). These batteries are relatively compact, deliver good steady voltage, and are readily available from many sources, since NiCads are used in camcorders, cellular phones and many other devices. But NiCads are cranky; it is hard to gauge their remaining charge accurately and if they are not deeply discharged periodically they permanently lose their ability to hold a full charge. Cadmium is also horribly toxic if it gets loose in the environment.

NiCads are gradually giving way to Nickel-Metal hydride (NiMh) batteries, which can deliver 15-20% more operating time for the same weight and volume. Some of the smallest portables, with very low power requirements, can use ordinary AA alkaline cells (flashlight batteries).

On the horizon are advanced Zinc-air batteries, with the promise of lighter weight, lower cost and longer life. A few diehards (like Apple's original Mac Portable and discontinued PowerBook 100) still use lead-acid gel cells, which are reliable and very forgiving of frequent partial recharges.

WHAT YOU NEED

The vast range of options makes choosing a portable computer a real challenge. The First Law of Computer Buying still applies:

•Anything you get today will be hopelessly obsolete in two or three years.

This implies that you should not spend more on a system than an amount equal to the value you expect to receive from it over a few years of use.

If a portable will be your only computer, you will probably want a full-featured system with good performance; that means something starting around $2000—and topping out around $4000. If a portable will be your second computer, used only for occasional trips, or note-taking and telecommunications when you are away from the office, you may be willing to settle for lower performance and bare essential features; something that can be had these days for around $1000.

Regardless of what you decide on, don't forget the Second Law of Computer Buying:

•Nobody ever regretted buying too much memory.

Expanding the memory on a portable can be expensive, since they often require special low-power chips, or expansion cards available only from the original manufacturer. For a portable Mac, the minimum amount of memory should be 4 Mb; and if you plan to run Windows on an MS-DOS portable, it's about the same. ■

How To Avoid Becoming A Frustrated Power Nerd

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CSC

Continued from page 46

Industry Group Arguments Against The Bill

characteristics of communications equipment design (as distinct from limitations in equipment capacity). On the other hand, it is clear that, over time, changes in the technologies used for communications will require the FBI (and the communications industry as a whole) to use new techniques and to acquire additional equipment and skills. Some developments, such as encryption, may make interception (or, at least, understanding the contents of what has been "intercepted") much more difficult—but in ways that are not even addressed and cannot be fixed by the proposed legislation. (It is difficult to evaluate the FBI argument that it would have asked for more interceptions if some technological barriers had not existed. There have always been and will always be some technological barriers to interception of the content of communications the participants seek to protect.)

INDUSTRY: "Any small business that installs its own local PBX system for forwarding calls from customers could be required to replace its equipment with new switches that meet the law's requirements. If current online information services do not track the 'services' and 'features' used by those who send messages through their electronic mail channels, then expensive modifications might be mandated."

Existing law requires all companies providing electronic communications services to cooperate fully with lawful requests from the FBI and other law enforcement officials—and there is no history of any general failure to provide such cooperation. Existing law also contemplates that the government will bear the costs imposed by the government's requests for access to communications. (As noted below, the proposal does not specifically extend that principle.) There is no showing that the government lacks the financial resources to modernize its communications equipment or to fund the costs of lawful interceptions that it initiates. Since the total number of content wiretaps in 1991 authorized by Federal and State courts was only 856 taps (and almost 60% of these were at the State level, 356 Federal versus 500 State), and since the call-set-up or pen register tap orders for 1991 at the Federal level were only 2,445, (thus, implying a national total under 7,000), it appears the costs may be better targeted to the specific lines or ports necessary, instead of burdening all lines or ports existing in the network. See Administrative Office of the US Courts "Report on Applications For Orders Authorizing or Approving the Interception of Wire, Oral, or Electronics Communications (Wiretap Report)" for the period January 1, 1991 to December 31, 1991 and letter from the Assistant Attorney General W. Lee Rawls to the Honorable Jack Brooks, Chairman of the Committee on the Judiciary of the United States House of Representatives, dated April 23, 1992, providing the annual report of the Attorney General on pen register orders. By comparison, there were over 138 million access lines as of December 31, 1990 according to the United States Telephone Association and this does not include ports used for cellular or many other network accesses. (We understand the current FBI budget provides for $9 million for new digital telephony interception equipment.) Thus, although there is valid reason to be concerned that changes in technology will challenge law enforcement agencies to find and adopt new techniques, there is no immediate crisis requiring swift action.

Broad Scope of the Current Proposal. The FBI proposal covers all providers of "electronic communications services" and all "private branch exchange operators." These days, that means just about everybody, including every business that has its own phone switch and every company that operates its own local or wide area computer network. The Electronic Communications Privacy Act defines "electronic communications services" to include electronic mail, file transfers over a Local Area Network ("LAN") and, indeed, every form of transmission of a message other than voice telephone calls (which are also covered by the proposal as "wire" communications), and sound waves in the open air (the only form of communication not covered by the proposal). See 18 USC. 2510(12),(15). All "providers" of such services would be affirmatively required, within three years, to provide law enforcement officials with the "capability and capacity" to intercept communications. This capability would have to be provided "concurrently" with the communication, without detection (apparently without regard to the target of the wiretap possibly employing sophisticated wiretap detection capabilities), exclusive of any communications between other parties, regardless of the mobility of the target, and without degradation of service.

These absolute requirements might not be capable of being met, as a technical matter, in some contexts, regardless of costs. The proposal is redundant, in the sense that it requires the ability to access communications at all points during their transmission, even though access at one point is all that is needed in any given circumstance. Although current wiretap law requires "minimization" and use of wiretaps as a "last resort," the proposal imposes obligations on all communications systems as if preserving the ability to wiretap at any point should be the system designer's highest priority. The application of these requirements would have substantially different costs and other implications depending upon where in a communications pathway they were actually applied. In any event, they dramatically expand the nature and reach of current law—which requires cooperation but does not grant the government a right to redesign the communications network or the equipment used by large numbers of businesses.

The FBI has defended its proposal on the ground that it is only seeking to "preserve the status quo," by preventing changes in technology from taking away capabilities that Congress meant to assure when it passed the 1968 and 1986 wiretap statutes. But that mischaracterizes the "status quo." The current wiretap statutes take the communications networks as they find them and do not require any provider of communications service to redesign the system, or to refrain from using any particular technology, solely on the ground that such a technology would make interception more difficult. While there may well be sound reasons for all concerned to cooperate to seek to preserve for the government a practical ability to engage in authorized wiretapping, there is simply no existing legal authority for law enforcement officials to mandate the use of particular technologies and, thus, contrary to the claims made by the FBI, the proposal does not simply maintain the status quo, but greatly expands the jurisdiction of the Attorney General and would represent a giant step beyond current law and congressional intent going back to 1968.

While the proposal imposes substantial uncertainties, to be discussed below, there is

Continued on page 278

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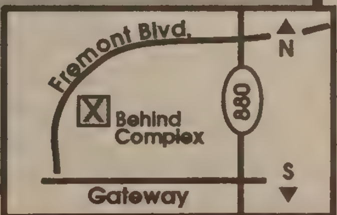
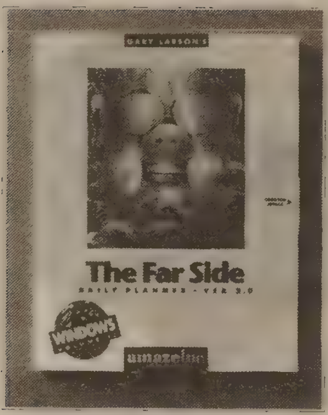


PRODUCT SPOTLIGHT

New Products

MAC SOFTWARE

DAILY PLANNER V2.0



The Daily Planner v2.0 is a multifeatured, computerized daily planner that is operational well beyond the year 3000. It offers an easy-to-use appointment calendar with a graphical user interface that allows for fun features like animated icons. Users can plan and view their schedules by the day, month, or year—and print each calendar in a variety of sizes to fit their paper appointment calendar books. The Daily Planner includes the Trivial Pursuit Daily Planner; The Far Side Daily Planner, Volume II; and the Cathy Daily Planner. Theme packs that include cartoons and animations, and allow users to install and run multiple themes on the daily planner are also available. These packs include The Far Side, Volumes I and II; Cathy; and Trivial Pursuit Sports and Genius. ($69.95) Amaze, Inc., 11810 115th Ave. N.E., Kirkland, WA 98034-6923. 1-800-395-1546.

EQUILIBRIUM DEBABELIZER

deBabelizer provides automatic universal graphics processing and manipulation and can be used by anyone who created and/or uses computer graphics. It automatically recognizes over forty different cross-platform bit-mapped graphics and animation formats. It writes over thirty different cross-platform bit-mapped graphics and animation formats. The batch processing and scripting functions save time by automating repetitive manipulation and editing tasks. A Super Palette feature creates the best palette for a series of graphics. ($299, a CD-I formats package is an extra $150) Equilibrium, Inc., 475 Gate Five Rd., Suite 225, Sausalito, CA 94965. (415)332-4343.

QUARKXPRESS XTENSIONS

Quark introduced a series of free XTensions for QuarkXPress 3.1. These add-on software modules are designed to enhance the v3.1 feature set and streamline the processing of QuarkXPress 3.1 files through service bureaus. This set of XTensions includes: FeaturesPlus, which lets users create fractions and prices with customized typographic preferences; NetworkConnection, allowing users to exchange pictures, text, and messages across a network from within

Continued

PRODUCT UPDATES

➤**Andrew Tobias' Managing Your Money 5.0 for the Macintosh** has been released at a reduced price. MECA Software, Inc., 500 Walls Dr., Fairfield, CT 06430-0912. 1-800-288-MECA.

➤**Approach Software** announced **Approach 2.0 for Windows**, a major upgrade to its Windows database. Registered users of Approach 1.0 for Windows may upgrade for $49. Customers who purchased v1.0 after July 31, 1990, are eligible to receive the upgrade for a minor shipping and handling charge. Approach Software Corp., 311 Penobscot Dr., Redwood City, CA 94063. (415)306-7890.

➤**ATI Technologies** has **lowered the prices** of many of its **Accelerator graphics boards**. The ATI Graphics Ultra and the 8514-Ultra will decrease in price by as much as 29%. ATI Technologies, Inc., 3761 Victoria Park Ave., Scarborough, Ontario, Canada M1W3S2. (416)756-0720.

➤**Claris** announced that users who purchase **ClarisWorks** between September 1, 1992, and January 1, 1993, will receive **Quicken** at no extra charge. Claris Corp., 5201 Patrick Henry Dr., Box 58168, Santa Clara, CA 95052-8168. (408)727-8227.

➤**Claris** released **FileMaker Pro 2.0 for the Macintosh**. Owners of any previous version of FileMaker may upgrade for $89. Claris Corp., 5201 Patrick Henry Dr., Box 58168, Santa Clara, CA 95052-8168. 1-800-544-8554.

➤**CYMA** announced a major upgrade to its top of the line **Professional Accounting Series software—PAS III**. CYMA Systems, Inc., 1400 E. Southern Ave., Tempe, AZ 85282. (602)831-2607.

➤**Fifth Generation Systems'** new Macintosh development division, formerly **Salient Software**, released **AutoDoubler 2.0**. Upgrades are $19.95 for registered users and free to those who purchased AutoDoubler after July 15, 1992. Fifth Generation Systems, Inc., 124 University Ave., Palo Alto, CA 94301. (415)321-5375.

➤**Frame Technology** is offering **FrameMaker 3.0 for Windows** bundled with **CorelDRAW for Windows**. Frame Technology Corp., 1010 Rincon Circle, San Jose, CA 95131.

➤**Granny's Old-Fashion Software** released **Ample Notice v3.0**. The update of this appointments scheduler and personal information manager package adds mouse support, pull-down menus, and a more extensive online help system. Granny's Old-Fashion Software, Inc., Route 4, Box 216, Boone, NC 28607. (704)264-9606.

➤**Kansai Electric** is bundling its four-user printer sharing device, **QuadLink**, with **Insight Development's PrinTools**, a set of six printer utilities. Kansai Electric USA, Inc., 2005 Hamilton Ave., Suite 220, San Jose, CA 95125. (408)377-7062.

➤**Microsoft** released **Microsoft Money 2.0 for Windows**. Microsoft Corp., One Microsoft Way, Redmond, WA 98052-6399.

➤**Polaris Microsystems**, of Pacheco, CA, acquired **Stellar Associates**. Polaris will honor warranties and provide technical support for all Stellar Associates' products and customers. Polaris Microsystems, Inc., 5702 Marsh Dr., Unit E, Pacheco, CA 94553. 1-800-775-2601.

➤**Softshell Systems** released **LAN Tamer Release 2.2** network menu system. Softshell Systems, Inc., 3200 Ash St., Palo Alto, CA 94306. 1-800-322-7638.

➤**Tektronix** announced a **trade-in program** for **QMS printers**. QMS color printer owners can get up to $2000 in cash for their old QMS ColorScript thermal wax color printer when they purchase a new Tektronix Phaser III PXi plain-paper color printer. The offer is valid through December 31, 1992. Tektronix, Inc., PO Box 1000, MS-63-583, Wilsonville, OR 97070-1000. 1-800-835-6100.

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3COM 3C509 ETHERLINK III 16-bit	140
3COM 3C509 ETHERLINK III 5-Pack	650
INTEL ETHEREXPRESS 16	135
INTEL ETHEREXPRESS 16 5 Pack (1 Doc/Drivers)	627
INTEL ETHEREXPRESS 16 20 Pack (1 Doc/Drivers)	2,007
NOVELL/EAGLE NE2000 16-Bit	139
NOVELL/EAGLE NE2/2C 16-bit Micro Channel	253
SMC ETHERCARD ELITE 16 Coax	144
SMC ETHERCARD ELITE 16 Coax 6 Pack	788
SMC ETHERCARD ELITE/A FOR PS/2	221
ACCTON 32-Bit EISA Coax/10BaseT Combo	450
EXOS/MICRODYNE 32-BIT EISA	625
INTEL ETHEREXPRESS 32-Bit EISA	580
NOVELL/EAGLE NE3200 32-Bit EISA	711
NOVELL/EAGLE NE2/32C 32-Bit MC	543

Token Ring

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3COM TokenLink III 16/4 EISA	746
IBM Token Ring Adapter 16/4	615
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HTI 10 Base-T 16-bit Ethernet Adapter	125
3COM 3C503-16TP ETHERLINK II 16 16-bit	209
3COM 3C503-16TP ETHERLINK II 16 5PK	825
3COM 3C507 ETHERLINK 16-bit TP	340
3COM 3C507 ETHERLINK 16-bit TP 5PK	1,394
3COM 3C509-TP ETHERLINK III 16-bit	140
3COM 3C509-TP ETHERLINK III 16-bit	650
3COM 3C523B 10 Base-T MC	337
3COM 3C523B 10 Base-T MC 5 Pack	1,517
ACCTON EN1640 ETHERCOMBO 16-Bit	175
INTEL ETHEREXPRESS 16 TP	145
INTEL ETHEREXPRESS 16 TP 5 Pack	675
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SMC ETHERCARD ELITE 16T 10 Base-T 6 Pack	799
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DLINK Pocket Ethernet Adapter BNC	250
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HTI Ext. Ethernet Adapter w/ Parallel Port	199
HTI Ext. 10 Base-T Adapter w/ Parallel Port	199
XIRCOM Pocket Arcnet Adapter TP	247
Pocket Arcnet Adapter COAX	267
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ASANTE 1012 12-Port Smart Hub	820
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EAGLE 4-port Hublet Mini-Repeater	228
HTI 8-port 10 Base-T Concentrator	399
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2813-04 10Base-T Conc. w/AUI(Adv.)	2,047
2814-03 10Base-T Conc. w/FO (Basic)	1,834
2814-04 10Base-T Conc. w/FO(Adv.)	2,259
Adv. Ethernet/TR Control Console SW	2,621

Repeaters

ACCTON EtherRepeater 2 AUI/2 BNC	685
IMC LANextender BNC/BNC-limited to 1 per lan	325
IMC Dual Port Ethernet Repeater BNC/BNC	492
IMC Quad Port Repeater (BNC/BNC + AUI/AUI)	600
IMC Multi-Port Repeater Chassis	568
IMC BNC Repeater Card for IMC Multi-Port Repeater	253
IMC 10BT Repeater Card for IMC Multi-Port Repeater	135

Network Printing

BRIGHTWORKS PS-Print (Software)	276
CASTELLE JETPRESS BNC/10 Base-T	436
FRESH TECH Printer Assist (Software)	175
INTEL LANSpool Print Server VAP (Software)	299
INTEL LANSpool Print Server NLM (Software)	449
INTEL NETPORT II for Ethernet	529
INTEL NETPORT II for 10 Base-T	529
INTEL NETPORT II for Token Ring	760

Uninterruptible Power Supplies

APC UPS Monitor Card for NetWare	80
APC250 (200watt UPS for workstations)	140
APC POWERDOCTOR for DOS	99
APC POWERCHUTE PLUS for Novell (VAP/NLM)	99
APC SMART-UPS 400	323
APC SMART-UPS 600	411
APC SMART-UPS 900	650
APC SMART-UPS 1250	844
APC SMART-UPS 2000	1,294
International Models available	Call
ELGAR IPX1100SL (1000w)	539

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INTEL NET SATISFAXTION Network Fax Software	653
OPTUS FACSys NetWare Fax Server Software	651
INTEL Satisfaxtion Modem 200	317

- The above solutions require a fax server

JETFAX II 9250 w/1 MB	569
JETFAX II 9450 w/ 4 MB	975

Tape Backup Solutions

COLORADO DJ-10 120MB	225
DJ-20 250MB	270
QFA-700 W/ CTRL 700 MB	1,100
TJ-10 120MB TRAKKER Parallel Port Tape Drive	395
TJ-20 250MB TRAKKER Parallel Port Tape Drive	479
TALLGRASS FILESECURE 500i (500MB)	1,058
FILESECURE 1000i (1GB)	1,599
FILESECURE 1300i (2.6GB)	2,399
MOUNTAIN FS1200 2.0GB Int. 4MM, SCSI	2,915
MOUNTAIN FS1200 2.0GB Ext. 4MM, SCSI	3,207

Server Based Tape Backup

ARCHIVE INT. PYTHON 2GB DAT w/VAP	2,218
ARCHIVE EXT. PYTHON 2GB DAT w/VAP	2,552
EXABYTE INT 2.2 GB 8MM w/VAP	2,673
EXABYTE EXT. 2.2 GB 8MM w/VAP	2,799
ARCHIVE INT. PYTHON 2GB DAT w/NLM	2,289
ARCHIVE EXT. PYTHON 2GB DAT w/NLM	2,624
EXABYTE INT 2.2 GB 8MM w/NLM	2,744
EXABYTE EXT. 2.2 GB 8MM w/NLM	2,870

MacIntosh Products

3COM 3C543 ETHERLINK/NB	395
ASANTE MC+IIE64 Coax/MAC II	158
ASANTE MC+IIET64 10 BaseT/MAC II	158
ASANTE MC+30iE64 Coax/IIsi & SE/30	158
ASANTE MC+30iET64 10 BaseT/IIsi &SE/30	158
ASANTE EN/SCPB Thick/Thin/10BT for Powerbook	346
ASANTE EN/SC10TPB 10BaseT for Powerbook	283

Cabling Supplies

RG58/RG62 Rachet BNC Crimper	75
RJ-45 Crimper	75
RG58 Ethernet BNC-Crimp (100 pak)	125
RG62 Arcnet BNC-Crimp (100 pak)	125
RJ45 10 BaseT Connectors (100 pak)	40
AT&T 10Base-T Ethernet Cable (1000' min)	100
BELDEN PVC RG58 or RG62 Cable (1000' min)	175
PLENUM RG58 or RG62 Cable (1000' min)	350
MICROTEST Cable Scanner Kit	1,095
MICROTEST Pair Scanner Kit	1,826
MICROTEST Ring Scanner Kit	948

Network Modems

SHIVA NET MODEM/E 9600 BNC	1,502
MICROTEST Ethernet LANModem	1,509
MICROTEST Token Ring LANModem	1,965

- MICROTEST LANModems allows connection of 2nd modem
- Above solutions attach directly to cabling

U.S. ROBOTICS Modem Sharing Kit V32BIS	635
U.S. ROBOTICS Dual Modem Sharing Kit	1,018

- Modem Sharing Kits requires non-dedicated workstation

Disk Sub-Systems for NetWare

Micropolis 675MB w/ SCSI-2 Host Adapter, Drivers, Enclosure. 16 ms w/ 5 year warranty	**2,195**
Maxtor 675 MB w/ SCSI-2 Host Adapter, Drivers, Enclosure. 17 ms	**1,975**
Micropolis 1GB w/ SCSI-2 Host Adapter, Drivers, Enclosure. 14 ms w/ 5 year warranty	**2,605**
Micropolis 1GB Mirrored w/ SCSI-2 Host Adapter, Drivers, Enclosure. 14 ms w/ 5 year warranty	**4,635**
Fujitsu 1.7GB w/ SCSI-2 Host Adapter, Drivers, Enclosure. 11 ms w/up to 5 year warranty	**3,775**
Fujitsu 1.7GB Mirrored w/SCSI-2 Host Adapter, Drivers, Enclosure. 11ms w/up to 5 year warranty	**6,975**

E-Mail w/ cc:Mail

cc:MAIL DOS Platform V4.0	205
OS/2 Platform	344
WINDOWS Platform	344
MacIntosh Platform	344
Lan Package + 10 USERS	240
Lan Package + 25 USERS	587
Lan Package + 100 USERS	2,287
Gateway	899
Remote	205
Fax	1,385
FaxView	690
Link to SMTP	2,079

Network Utilities

CHEYENNE Monitrix Network Mgmt.	595
Utils for NetWare 286/386	262
ARCserve NLM V4.0 (up to 5 users)	273
ARCserve NLM V4.0 (up to 20 users)	810
ARCserve NLM V4.0 (up to 50 users)	1,018
ARCserve NLM V4.0 (up to 250 users)	1,295
ARCserve VAP V4.0 (5 users)	218
ARCserve VAP V4.0 (10 users)	511
ARCserve VAP V4.0 (any users)	879
ARCserve Solo	185
SABER Menu for DOS-10 users	142
Menu for DOS-25 users	281
Menu for DOS-100 users	963
Menu for DOS-250 users	3,725
LAN Admin Pack-10 users	224
LAN Admin Pack-25 users	395
LAN Admin Pack-100 users	1,417
LAN Admin Pack-250 users	3,405
DIRECT ACCESS Network Menu	366
FRYE UTILITIES NetWare Management v1.1	324
NetWare Management Add'l License	276
Early Warning System v1.1	324

- **All prices listed are cash prices.**
- **All orders shipped C.O.D. from So. S.F.**
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- **20% restock fee applies to all non-defective returns and refused shipments.**

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Network Products

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- **Prices subject to change without notice.**
- **We are not responsible for typographical errors.**
- **Shipping & Handling charges will be added to all orders.**
- **Quantity pricing available for 10 units or more.**

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FAX: (415) 872-6634

QuarkXPress; Aldus PageMaker Import XTension; WP Filter; PhotoShop Plug-In; and others. (XTensions may be ordered directly from Quark for a prepaid $25 shipping and handling fee. They are also available free through various online services including America Online, CompuServe, and AppleLink) Quark, Inc., 300 S. Jackson St., Denver, CO 80209. (303)934-2211.

CLARIS MACPROJECT PRO

Offering over one hundred new features, MacProject Pro lets users create project schedules quickly using a built-in Outline, manage resources and budgets for multiple projects accurately, present plans with customized charts and reports, and share data and graphics. MacProject Pro's intuitive Outline speeds project planning and data entry by letting users create complete schedules starting with a task list. As users' needs grow with more complex projects, MacProject Pro offers unlimited tasks and resources, and the ability to correct staff overloads across multiple projects. With full support for System 7, including Publish and Subscribe and Apple Events, users can update project schedules from, or create custom graphs and reports in, other applications. (Suggested retail price is $599, users of any previous version of MacProject may upgrade for $99) Claris Corp., 5201 Patrick Henry Dr., Box 58168, Santa Clara, CA 95052-8168. (408)987-7000.

MAGNET 1.0

Magnet 1.0 uses agent technology to let users create "personal assistants" or agents to automate a wide range of repetitive file-related tasks. Agents act like magnets, attracting files to their location at prespecified times. To create an agent, the user tells Magnet what files to find, what to do with the files (such as copy or move), and when to do so. This is done through an easy point-and-click interface, which requires no scripting. Some of the tasks that Magnet can automate include: backing up data, synchronizing of your desktop Mac and PowerBook, keeping shared files current, and file find and management. This program requires a Mac running System 7. ($129.95) No Hands Software, Inc., 200 Page Mill Rd., Suite 260, Palo Alto, CA 94306. (415)321-7340.

CLICKART ARTISTRY & BORDERS

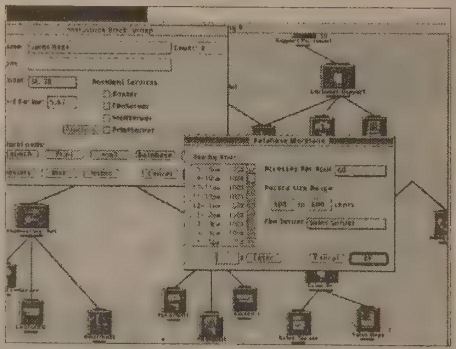
ClickArt Artistry & Borders, from T/Maker, is a collection of more than 325 high-quality EPS images, including over 150 in full color. The graphics can be used to make attractive borders and add visual impact to invitations, stationary, and other documents. This collection includes people, businesses, flower and animal accents, labels, initial caps, and more than sixty borders. ClickArt Artistry & Borders color images were created using CYMK, allowing you to create process color separations for commercial printing. The color images print with a grayscale appearance on devices that output to black-and-white only, such as the Apple LaserWriter. ($129.95) T/Maker Co., 1390 Villa St., Mountain View, CA 94041. (415)962-0195.

SPREADBASE

Developed to fill a major gap in the market between current tools for business analysis and the need for tools that can integrate, respond to, consolidate, and dynamically present data on the desktop, SpreadBase is targeted at desktop business analysts—CFOs, product managers, sales managers, forecast analysts, manufacturing planners, etc. This is a new category-based modeling tool that combines the user interface familiarity and analytical flexibility of spreadsheets, with the power of a rational database to offer a major productivity leap for business analysts. The key to SpreadBase is the concept of categories—a set of items with similar characteristics. Data and related information are specified by category rather than by individual item and will be shown in all views. ($695) Object Software, Inc., 248 Homer Ave., Palo Alto, CA 94301. (415)324-3333.

NETVANTAGE II

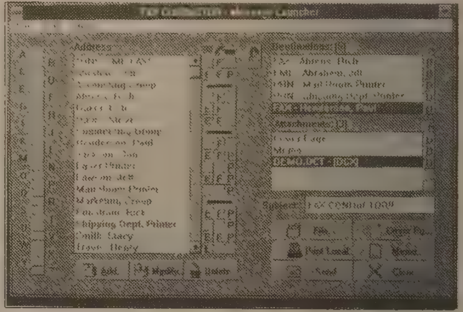
NetVantage II is a unique new Apple network design, simulation, and optimization tool for the Macintosh, targeted for network designers, managers, and administrators who run AppleTalk on LocalTalk, EtherTalk, or TokenTalk networks. It can model very small or very large networks and provides packet-level simulation as well as high-speed performance modeling. NetVantage II's Mac-standard user interface allows fast network design and configuration by click-and-drag selection of network components, then wiring the resulting component blocks together. (Suggested list price for NetVantage II/50 for modeling networks of up to fifty nodes is $999; NetVantage II for any size network is $4995) EclecTec Software, Inc., 269 Mt. Herman Rd., Suite 202, Scotts Valley, CA 95066. (408)461-2040.



COMMUNICATION HARDWARE

FAX CONDUCTOR 750

Fax Conductor 750, a 25MHz 386SX, is a fully featured communications server with a graphical user interface that significantly simplifies and unifies faxing, printing, and email for Windows users in a Novell NetWare environment. It can automatically route incoming faxes to the appropriate network user with an email message alerting recipients of pending faxes. On-screen viewing is facilitated with convenient zoom and rotation features. Fax Conductor tracks and logs all incoming and outbound faxing activity, giving the network manager an accurate means of accounting for controlling costs. Because this is a shared resource, capable of serving from twenty-five to 250 nodes, the cost per node is much lower than add-in boards. Other features include cost-saving delayed sending, automatic redial, and built-in security. OCTuS, Inc., 9940 Barnes Canyon Rd., San Diego, CA 92121-2784. (619)452-9400.



COMMUNICATION SOFTWARE

BITCOM & BITFAX FOR WINDOWS

BitFax and BitCom telecommunications programs have been introduced for Windows 3.1. BitFax for Windows allows sending and receiving of faxes through a personal computer. BitCom for Windows provides a powerful scripting language to automate routine communications tasks. BitFax allows faxes to be sent directly from

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213MB HARD DRIVE SVGA SYSTEM

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- 4MB RAM
- 213MB MAXTOR HARD DRIVE
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- SVGA CARD
- 1.2 & 1.44MB FLOPPY DRIVE COMPLETE SYSTEM WITH DELUXE CASE AND KEYBOARD
- MOUSE

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486-25

130MB HARD DRIVE SVGA SYSTEM

- 486-25MHZ CPU
- 4MB RAM
- 130MB MAXTOR HARD DRIVE
- VIEWSONIC SVGA MONITOR
- SVGA CARD
- 1.2 & 1.44MB FLOPPY DRIVE COMPLETE SYSTEM WITH DELUXE CASE AND KEYBOARD
- MOUSE

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80MB HARD DRIVE VGA SYSTEM

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- 1.2 OR 1.44MB FLOPPY DRIVE COMPLETE SYSTEM WITH DELUXE CASE AND KEYBOARD
- MOUSE

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VIEWSONIC MONITORS

VIEWSONIC 1	$240
VIEWSONIC 4	305
VIEWSONIC 6	355
VIEWSONIC 5E	410
VIEWSONIC 6FS	625
VIEWSONIC V7	1045
VIEWSONIC V8	1580

VIDEO GRAPHICS

ALLCUMOS 256K	$34
TRIDENT 9000	49
TRIDENT 8900	69
DIAMOND 24X	169
DIAMOND SPEEDSTAR 24	149
ORCHID PRO IIS	140
DIAMOND STEALTH	240
FAHRENHEIT 1280	240

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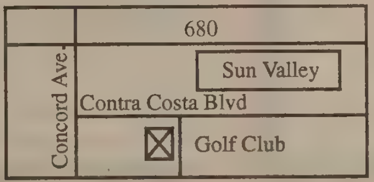

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SUPER SALE

486DX2-66/64K EISA	$1,898
486-50/64K EISA	$1,668*
486-33/64K EISA	$1,498*
486DX2-66/64K ISA	$1,698
486DX2-50/64K ISA	$1,418
486SX-25/64K ISA	$1,068

- Motherboard w/CPU
- 4MB RAM 70NS
- 1.2MB and 1.44MB FDD
- IDE Controller w/2S/1P/1G
- 130MB 16MS Hard Drive
- 101-Key Enhanced Keyboard
- 1024•768 .28DPI 14" Color Mon.
- 512K SVGA Card
- Mini Tower or Desktop Case
- 200W Power Supply

Options
- Add $40 for 256K Cache
- Add $30 for Non-Interlaced Monitor
- Add $20 for 1MB SVGA Card
- Add $80 for 200MB Hard Drive

SUPER SALE

486-50/64K ISA	$1,478*
486-33/64K ISA	$1,318*
486DX2-66 LOCAL BUS	$1, 828
486-50/64K LOCAL BUS	$1,578*
486DX2-50 LOCAL BUS	$1,518
486-33/64K LOCAL BUS	$1,408*

- Motherboard w/CPU
- 4MB RAM 70NS
- 1.2MB and 1.44MB FDD
- IDE Controller w/2S/1P/1G
- 130MB 16MS Hard Drive
- 101-Key Enhanced Keyboard
- 1024•768 .28DPI 14" Color Mon.
- 512K Card (1MB for Local Bus)
- Mini Tower or Desktop Case
- 200W Power Supply

Options
- Add $40 for 256K Cache
- Add $30 for Non-Interlaced Monitor
- Add $20 for 1MB SVGA Card
- Add $80 for 200MB Hard Drive

SUPER SALE

486SX-20/64K ISA	$998
386-40/64K CACHE	$914
386-33/64K CACHE	$908
386DX-25	$888
386SX-33	$808
386SX-25	$788

- Motherboard w/CPU
- 4MB RAM 70NS (2MB for 386SX)
- 1.2MB and 1.44MB FDD
- IDE Controller w/2S/1P/1G
- 80MB 16MS Hard Drive
- 101-Key Enhanced Keyboard
- 1024•768 .39DPI 14" Color Mon.
- 512K SVGA Card
- Mini Tower or Desktop Case
- 200W Power Supply

Options
- Add $20 for 1MB SVGA Card
- Add $40 for .28DPI SVGA Monitor
- Add $50 for 130MB Hard Drive
- Add $140 for 200MB Hard Drive

NOTEBOOK COMPUTERS

486DX-33/4MB RAM/120MBHD	$2,668
486DX-33/4MB RAM/80MBHD	$2,468
386SX-25/4MB RAM/120MBHD	$1,668
386SX-25/4MB RAM/80MBHD	$1,468
386SX-25/2MB RAM/80MBHD	$1,268

Features
- 1.44MB Floppy Drive
- VGA 640x480 Resolution
- DOS 5.0
- Serial & Parallel Port
- Please Call for Details

TERMS AND CONDITIONS

1. One year parts and labor warranty on systems.
2. Knowledgeable technical support engineers in service.
3. Prices and availability subject to change w/o notice.
4. Shipping, insurance and COD charges are extra and non-refundable. Prices reflect cash discounts.
5. Return shipping must be insured, prepaid and bearing an RMA# on the shipping label.
6. Defective items replaced or repaired at our discretion.
7. No responsible for typos.
8. All returns subject to 15% restocking fee and cover only Hi-Tech USA brand computers, excludes peripherals and software. No refunds after 30 days.
9. Superior reputation for service, quality and value.
10. Purchase orders are welcomed and subject to approval.

*** Due to market conditions please call for current prices.**

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SYSTEM	M/B + CPU	BASIC SYSTEM	BASIC SYS +40MB HDD + 12" MONO & MGP CARD	BASIC SYS + 40MB HDD + VGA CARD & MONITOR	BASIC SYS + 40MB HDD + SVGA CARD & MONITOR	BASIC SYS +80MB HDD + SVGA CARD & MONITOR	BASIC SYS +120MB HDD + SVGA CARD & MONITOR	BASIC SYS W/4MB RAM 1.2 & 1.44 FDD +130MB HDD +SVGA CARD & MONITOR	BASIC SYS W/4MB RAM 1.2 & 1.44 FDD +170MB HDD +SVGA CARD & MONITOR	BASIC SYS W/4MB RAM 1.2 & 1.44 FDD +200MB HDD +SVGA CARD & MONITOR
486DX2-66C EISA	$1,048	$1,218	$1,460	$1,584	$1,614	$1,664	$1,714	$1,878	$1,918	$1,968
486DX-50C EISA*	792*	968*	1,210*	1,334*	1,364*	1,414*	1,464*	1,628*	1,668*	1,718*
486DX-33C EISA*	638*	798*	1,040*	1,164*	1,194*	1,244*	1,294*	1,458*	1,498*	1,548*
486DX2-66C ISA	848	1,018	1,260	1,384	1,414	1,464	1,514	1,678	1,718	1,768
486DX-50C ISA*	618*	778*	1,020*	1,144*	1,174*	1,224*	1,274*	1,438*	1,478*	1,528*
486DX2-50C ISA	538	708	950	1,074	1,104	1,154	1,204	1,368	1,408	1,458
486DX-33C ISA*	416*	574*	816*	940*	970*	1,020*	1,070*	1,234*	1,274*	1,324*
486SX-25C ISA	190	346	588	712	742	792	842	1,006	1,046	1,096
486SX-20C ISA	170	334	576	700	730	780	830	994	1,034	1,084
386DX-40/64C	152	314	556	680	710	760	810	974	1,014	1,064
386DX-33/64C	150	312	554	678	708	758	808	972	1012	1062
386DX-25	132	294	536	660	690	740	790	954	994	1,044
386SX-33	100	266	508	632	662	712	762	926	966	1,016
386SX-25	90	250	492	616	646	696	746	910	950	1,000
386SX-16	80	246	488	612	642	692	742	906	946	996
**286-20	64	220	462	586	616	666	716	880	920	970

BASIC SYSTEM CONFIGURATION:

Motherboard & CPU, 1MB (512KB for 286 systems) memory installed, 1:1 2HD/2FD controller, 1.2MB or 1.44MB Floppy Drive, Internal Clock/Calendar, Enhance Case with Power Supply, and 101-Key Enhanced Keyboard.

* Due to market conditions please call for current prices. ** Please call for 286-16 and 286-12 prices.

VIDEO OPTIONS

12" Mono monitor w/MGP card	$85
14" Mono monitor w/MGP card	99
14" VGA monitor w/16-bit VGA card	208
14" SVGA monitor with 512k card	248
VGA-256K (800•600, 16-Bit)	26
VGA-512K (1024•768, 16-Bit)	36
1M SVGA card (1024•768•256)	54
Diamond Speed Star Plus w/ 1MB	112
Diamond Speed Star 24 w/ Hi-Color	138
Diamond Speed Star 24X w/ Hi-Color	164
Diamond Stealth VRAM	204
Orchid IIs w/ 1MB (w/SYS)	112
Orchid IIs/Hi-Color (w/SYS)	122
Orchid Fahrenheit (w/SYS)	202
ATI Graphic Vantage w/Mouse	210
ATI Graphic Ultra w/ Mouse	298
Nanao 9070u (16", 1024•768, 0.28)	768
Nanao 9080i (16", 1280•1024, 0.28)	916
Nanao F550i (17", 1280•1024, 0.28)	1,026
NEC 3FGX (15", 1024•768, 0.28)	620
NEC 4FG (15", 1024•768, 0.28)	730
MAG 15H (15", 1280•1024, 0.28)	584
Sony CPD 1304S	540
Sony CPD 1604S	978
IDEK MF-5217 (17")	868
HITACHI CM-2085M+ (20")	1,358
HITACHI CM-2187M (21")	2,288
TOSHIBA P17CS01 (17")	1,158
TOSHIBA P21CR00 (21")	1,798
14" VGA Mono Monitor	110
Standard VGA (640•480) Monitor 0.51	182
Super VGA (1024•768) Monitor 0.39	212
Super VGA (1024•768) Monitor 0.28	252
Super VGA Non-Interlaced Monitor 0.28	282
Viewsoic 4 E	286
Viewsoic 5 E	386
Viewsoic 5 +	486
Viewsonic 6 E	326
Viewsonic 7	1,016
Viewsonic 8	1,516

HARD / FLOPPY DRIVE ADAPTERS

IDE 2FD/2HD w/512K Cache	$144
IDE 2FD/2HD with 2S/1P/1G	16
MFM 2FD/2HD	36
Ultrastor ESDI w/32K Cache (ISA)	154
Adaptec SCSI 1542KB w/Kit (ISA)	242
Bustek SCSI (EISA)	302
Ultrastor SCSI 24F (EISA)	444
Ultrastor ESDI 22F (EISA)	444

PRINTERS

Citizen 200GX (9-Pin)	$154
Citizen GSX-130 (24-Pin)	200
Citizen GSX-140 Plus (24-Pin)	280
Citizen GSX-145 (24-Pin)	388
Color Option for Citizen Printer	48 / 68
Panasonic KX-P1180	154
Panasonic KX-P1123	200
Panasonic KX-P1124 i	280
Panasonic KX-P1624	354

KEYBOARDS

101 Enhanced Keyboard	$20
Maxiswitch / Keytronics	30 / 34
Focus 2001 / 5001	38 / 60
Omnikey 101	66
Omnikey 102	66
Omnikey Ultra	94

MATH COPROCESSORS

Intel 80287-10	$44
Intel 387SX-25 / 20 / 16	90
Intel 387DX-33 / 25 /20 / 16	92
CYRIX 387DX-40 / 33	106/ 82
CYRIX 387SX-25 / 16	80 / 74

NEW HARD DRIVES

40mb/28ms or 52mb/19ms (IDE)	$158 / 168
80mb/18ms or 100mb/18ms (IDE)	208 / 238
120mb/16ms (IDE)	258
130mb/16ms (IDE)	268
170mb/16ms (IDE)	298
200mb/16ms or 240mb/15ms (IDE)	348/ 478
200mb/16ms (SCSI)	478
340mb/15ms (IDE)	648
676mb/16ms (SCSI)	1,098

MISCELLANEOUS

Windows 3.1 with Mouse (with system)	$48
Windows 3.1 (with system)	38
Internal Modem 2400 Baud	36
Internal Modem 9600 Baud	216
Fax Modem (9600 Fax, 2400 Modem)	54
Fax Modem (9600 Fax, 14,400 Modem)	276
3-button Mouse	13
Logitech Mouseman Serial/Bus	63/63
Colorado Tape Backup 120mb	176
Colorado Tape Backup 250mb	230
ATI Sound Card Pro	128
SONY CD-ROM CDU535 / 541	328 / 428
16-Bit Ethernet Card COAX/10Base-T	74

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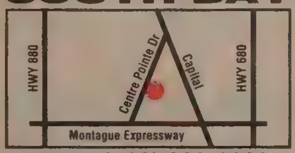

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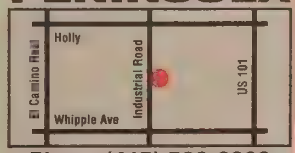

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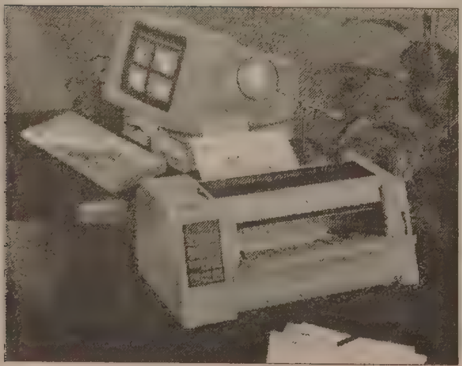
Windows applications with simple point, click, and fax commands, while BitCom for Windows allows users to log onto their favorite online service with a single mouse click. BitFax for Windows is designed to serve the newest generation of notebook and laptop computer users who use fax/modems while traveling and do not have access to a printer. Faxes can be sent or received in the background for utilization of the multitasking benefits of Windows. (BitFax/BitCom for Windows, $148) BIT Software, Inc., 47897 Fremont Blvd., Fremont, CA 94538. (510)490-2928.

MAIL*LINK FOR CC:MAIL/QM

Connecting Macintosh QuickMail users with cc:Mail users on PCs and Macintoshes, Mail*Link provides transparent connectivity between the leading email packages on the Macintosh and PC platforms. The features include streamlined administration via a Preferences Subsystem and special handling of enclosures to make them easier to use by PC recipients. Mail*Link for cc:Mail/QM is specifically designed to run with cc:Mail's MHS gateway in SMFLink mode, which does not require that NetWare MHS be running. This means that an MHS host does not need to be set up and maintained. (Price varies with the number of QuickMail users) StarNine Technologies, Inc., 2550 Ninth St., Suite 112, Berkeley, CA 94710. (510)649-4949.

PRINTERS

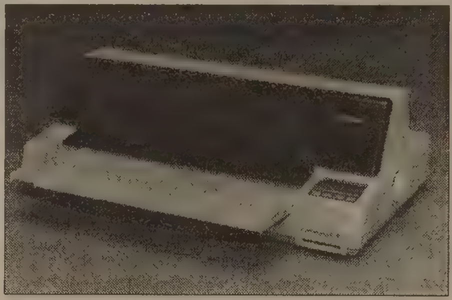
IBM 2390 PS/1 PRINTER



The new IBM 2390 PS/1 Printer, available from Lexmark International, is designed for home office and small business PC users. It is a 24-wire, narrow-carriage dot matrix printer, with 360 x 360dpi, that prints up to 200cps in FastDraft and 60cps in letter-quality mode. A paper tear-off feature is included so that forms are advanced only to the end of the print job. Also offered is a snap-in, clean hands, IBM Auto-Inking ribbon that yields 3.5 million characters per cartridge. The IBM PS/1 personal computer's technical support service, now available to PS/1 Printer customers, provides eighteen-hour-a-day toll-free assistance by telephone or through the Prodigy online bulletin board. ($499) Lexmark International, Inc., 740 New Circle Rd., Lexington, KY 40511. 1-800-358-5835.

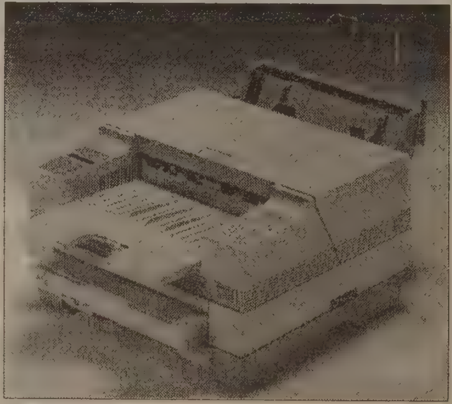
PROWRITER C-615 I I PRINTER

The new ProWriter C-615 II 16.5" wide-carriage, 24-pin flatbed printer features a straight-through paper path for jam-free operation. It offers draft speeds of 300cps, and letter-quality speed of 100cps with 12cpi. Complementing its standard parallel and serial interfaces, the C-615 II printer provides IBM Proprinter X24E and Epson LQ-850+ emulation. The C-615 II has an enlarged library of resident fonts that includes Draft, Courier, Elite, Roman, and San Serif. Fourteen optional font cards are available. ($1175) C-Tech Electronics, Inc., 2515 McCabe Way, PO Box 19673, Irvine, CA 92713-9673. 1-800-347-4017.



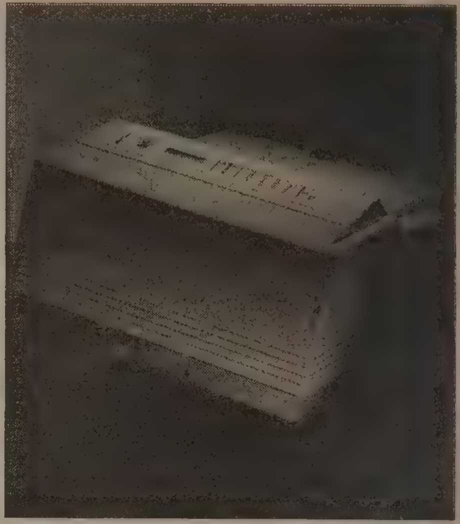
MUTOH CP-503 LASER PLOTTER

The CP-503 desktop plain-paper laser plotter is designed to provide high-quality A- and B-sized check plots for A/E/C, mechanical CAD, and electric and printed circuit board design applications. The new laser plotter has a plotting speed of 8 pages per minute and offers resolution of 400 x 400dpi. Its unique auto-scale function permits end-users to quickly and easily reduce drawings without having to reconfigure their driver. Users can choose between fifteen selectable line widths. The CP-503 is HP-GL-compatible and includes both RS-232C and Centronics ports. ($8495) Mutoh America, Inc., 500 W. Algonquin Rd., Mt. Prospect, IL 60056. (708)952-8880.



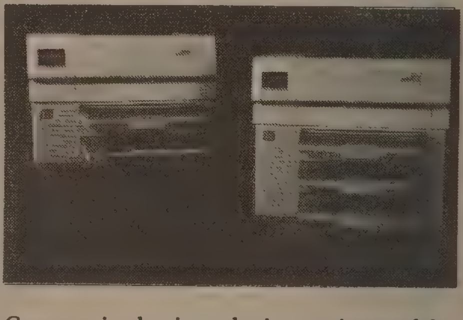
CALCOMP CCL 600 PRINTER

The CCL 600 is a high-performance, tabloid (11" x 17"), monochrome laser printer with switchable 300 x 300dpi and 600 x 600dpi. This printer is ideal for a wide variety of printing and publishing, CAD/CAE, and general office applications. Microsoft's TrueImage allows the CCL 600 to be PostScript-compatible. Additionally, the printer is compatible with HP-GL-2 and PCL 5. It comes standard with RS-232C serial, Centronics parallel, and AppleTalk interfaces, plus two PCMCIA slots for future add-on fonts and emulation. For networking capability, automatic I/F and emulation switching are also standard. ($4495) CalComp, Inc., 2411 W. La Palma Ave., Anaheim, CA 92801. 1-800-932-1212.



COMPAQ PAGEMARQ PRINTERS

The Compaq Pagemarq 20-page-per-minute and 15ppm printers, with PostScript Level 3 software from Adobe and PCL 5 emulation, provide exceptional throughput and a superior combination of direct network connectivity, unmatched paper capacities (up to 1500 pages) and variety of sizes (up to 11" x 17"), ease of operation, remote management capabilities, and high-resolution graphics (up to 800 x 400dpi).



Compaq is also introducing an internal fax modem option that allows users to send PostScript-quality graphics over phone lines in sizes up to 11" x 17". For permanent storage of PostScript fonts for easy accessibility by all users on a network, optional 1 and 2MB programmable font modules and an internal 60MB hard drive are available. (Pagemarq 15, $3999; Pagemarq 20, $5499) Compaq Computer Corp., PO Box 692000, Mail Drop 120208, Houston, TX 77269-2000. 1-800-345-1518.

Continued

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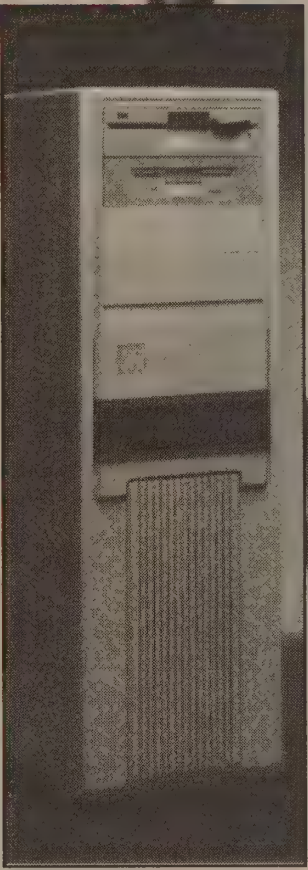

COPO PC IV SYSTEM

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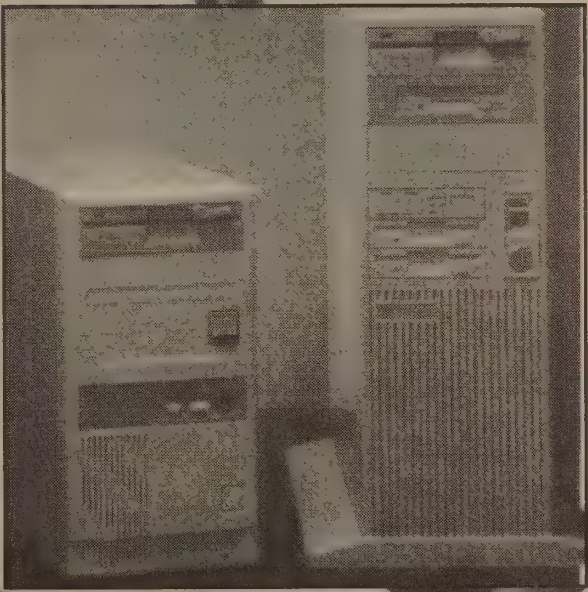

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REVIEWS

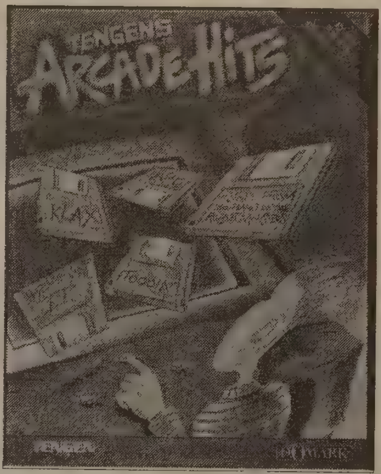
GAME REVIEWS

By Mike Markowitz

TENGEN'S ARCADE HITS

Designed By: Tengen (Japan)
Published By: Domark
Distributed By: Accolade
For: MS-DOS (12+MHz CPU, 640K, joystick or mouse optional, EGA, CGA, or Tandy 16-color graphics, Amiga version also available
List Price: $39.95

Tengen is a leading maker of coin-operated arcade game machines. Domark, a British software publisher (distributed in the US by Accolade) secured the rights to do these MS-DOS conversions of some of Tengen's classics. What a deal—five games for the price of one.



Hard Drivin' II is a sportscar stunt racing game. You can design your own track, and even race against a live opponent on another PC or Amiga connected through a null modem cable.

KLAX is a game of marching colored tiles. As they advance toward you, you have to catch them with your paddle and flip them into one of five bins, to create horizontal, vertical, or diagonal rows of the same color.

Toobin' lets you ride an inflated inner tube down a wild river. You have to avoid obstacles and pick up floating tin cans to hurl at fly fishermen, swamp monsters, and kamikaze penguins that infest the riverbank.

Escape From the Planet of the Robot Monsters is a two-player rescue mission (the player controls are mapped to opposite ends of the keyboard).

APB is a cartoon-style game that puts you in the role of Officer Bob, patrolling the mean streets of the city, in pursuit of Sid Sniper, Freddy Freak, and other offenders. Between car chases you can stop by the Drive-In Donut Shop to get extra time, or visit the Speed Shop to buy extra equipment for your car.

Graphics and Animation: cute
Sound: varied beeps
User Interface: crude
Overall Play Value: nostalgic

Although these games are not copy-protected, neither are they hard disk installable—you have to run them from a floppy drive. (Domark, Inc., 1900 S. Norfolk Ave., Suite 202, San Mateo, CA 94403. 415/513-8929)

TRISTAN: SOLID STATE PINBALL

Programmed By: G. Snowman
Published By: Amtex
For: MS-DOS (2MB RAM, 386 or 486 CPU, VGA or SVGA graphics, Ad Lib and Sound Blaster audio cards supported), Macintosh version also available

Continued

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NEC 5FG/6FG	1150/2675
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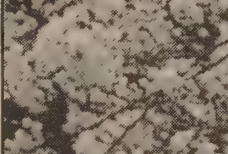

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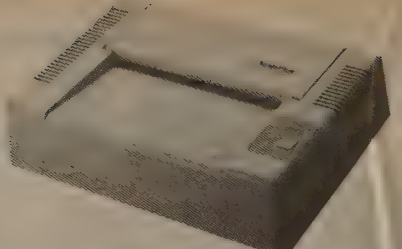

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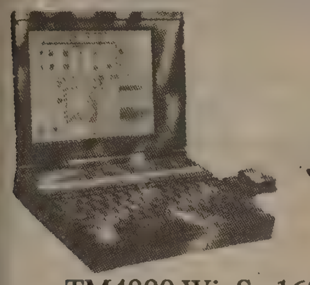

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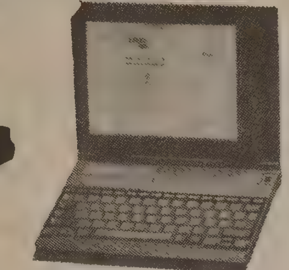

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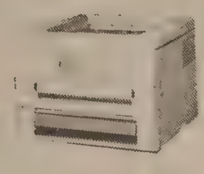

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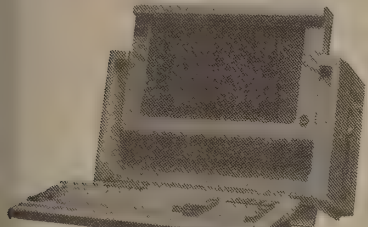

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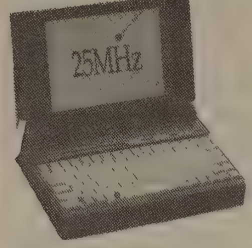

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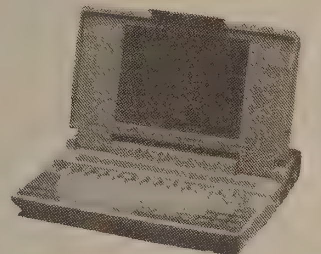

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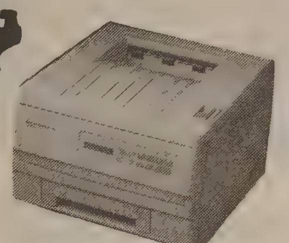

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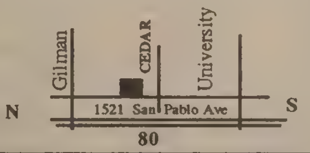
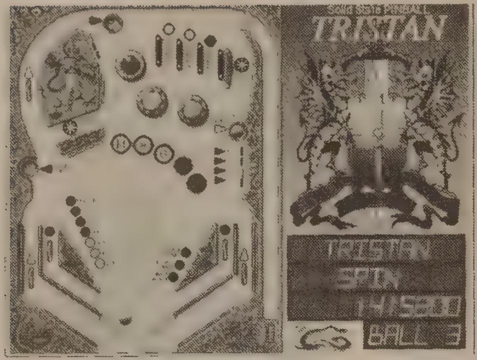


List Price: $69.95

The Mac version of this pinball simulation is the best-selling Macintosh game in Japan, a nation that takes its pinball seriously. This MS-DOS conversion, developed in Canada, provides wonderful realism if you have the hardware to support it. Amtek has licensed the design rights to the classic pinball machines made by Bally, Williams, and Gottlieb, and plans to bring more of them to the small screen.



The ball moves exactly as the laws of physics would dictate, and the sound effects (even without an audio card) are authentic. The scoring and bonus system has enough Baroque complexities to delight the most hardcore pinball wizard. About the only objection a potential buyer might raise is that you only get one configuration; this is no pinball construction set.

The user interface is a marvel of simplicity. The left and right Shift keys independently control the flippers, the Enter key operates the plunger, and the Space bar lets you "nudge" the machine (at the risk of a catastrophic TILT! alarm).

The program is installed from two high-density disks, and its twenty-seven files require 1546K of hard disk space. You have to input your name and a serial number the first time you run Tristan, and the program requires you to answer a question from the manual every time you start a game. The package also includes a bright, shiny, genuine steel pinball. (Amtex, Inc., 512 S. Castlerock Terr., Sunnyvale, CA 94087. 510/935-2074)

Graphics and Animation: 9
Sound: 9+
User Interface: 9
Overall Play Value: 8

CARRIERS AT WAR

Designed By: Roger Keating and Ian Trout
Published By: Strategic Studies Group
For: MS-DOS (640K, EGA/VGA graphics, supports AdLib or Sound Blaster audio card, mouse recommended), Macintosh and Amiga versions under development
List Price: $69.95

Back in 1984, when the original 8-bit version of this game was released for the Apple II and Commodore 64, the designers lamented the limitations imposed by 64K of memory. Today they have ten times as much RAM to play with, and they have taken advantage of every bit to create a visually stunning and historically impeccable simulation of the Pacific carrier battles of the Second World War.

The computer can play either side, or mediate a battle between two human players. SSG has been perfecting its artificial intelligence routines for ten years, and the computer opponent is competent and unpredictable. The battles include Pearl Harbor (not much fun for the American side, but a good introductory tutorial), Midway, The Coral Sea, The Eastern Solomons, Santa Cruz, and The Philippine Sea.

The user interface includes a menu bar and a variety of complex, but highly pictorial and functional displays for your fleets and aircraft squadrons. Most tactical decisions can be made by pointing and clicking. For example you can set course for a task force by simply clicking on any spot in the ocean—the ships will sail toward that point. If a target is out of range for some of your squadrons, those squadrons will simply not be available on the Strike display.

CARRIERS AT WAR
SSG

Combat takes place between individual ships and waves of up to five aircraft at a time. When hits are scored, you can see animated explosions and fires break out. Since pilots on both sides exaggerated the number of hits they scored, the program randomly inflates the damage reports; to find out how well you really did, you have to wait for the final report at the end of the game.

For the American side, the game is a series of sobering lessons. For the first two years of the war, your torpedoes are utterly unreliable. Much of your airpower consists of land-based high-altitude bombers (like the B-17) which had almost no chance of hitting a moving enemy ship.

SSG is developing a scenario editor for the game that will be sold separately. This seems reasonable, considering the size and complexity of the package.

The game is installed from two high-density disks (separate 3.5" or 5.25" packages) and takes up almost 5MB of disk space. The 136-page manual is the best SSG has ever produced, with clear, well-illustrated explanations of game functions and a thoughtful technical history of the Pacific war. (Strategic Studies Group, 8348 Monticello Dr., Pensacola, FL 32514. 904/494-9373. Fax: 904/494-9374)

Graphics and Animation: 8
Sound: 8
User Interface: 9
Overall Play Value: 9

AMIGA SOFTWARE REVIEW

SCENERY ANIMATOR 2.0

Published By: Natural Graphics
List Price: $99.95

VISTAPRO 2.0

Published By: Virtual Reality Labs
List Price: $99.95
Reviewed By: Douglas J. Nakakihara

Scenery Animator and Vistapro are landscape generators (LG) that use US Geological Survey Digital Elevation Model (DEM) data to generate accurate 3-D landscape pictures. The landscape you add—oceans, lakes, rivers, snow, trees, etc.—follows the existing terrain and won't appear where they wouldn't naturally. You can also change the direction of the sun, add a star-filled sky, or even adjust the cloud density. Depending on which LG you use, you can choose locations like Yosemite, Mount St. Helens, Lake Tahoe, and even Mars. Both companies offer additional DEM files. Vistapro allows you to create your own terrains using special IFF picture files as data.

Plotting a path for your camera creates "fly-by" animations. In addition to setting the camera's path, you can set its elevation, pan left or right, and change the type of lens (i.e., wide angle, zoom, etc.). These animations give the feeling of being inside a jet flying over mountains and lakes, through canyons, etc. These programs are also great for creating still background pictures.

Both programs support all of the native Amiga display modes plus 24-bit IFF, but really shine when used in conjunction with Digital Creation's DCTV. DCTV makes possible full-color animations with fast frame rates, which you can send directly to video tape. Both programs provide direct support for DCTV.

Scenery Animator (SA) paints landscapes before your very eyes; lines like brushstrokes appear on the screen, eventually forming the finished picture. This is very interesting to

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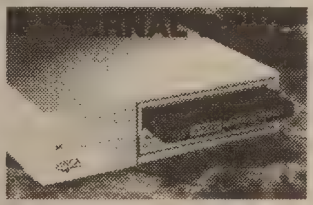

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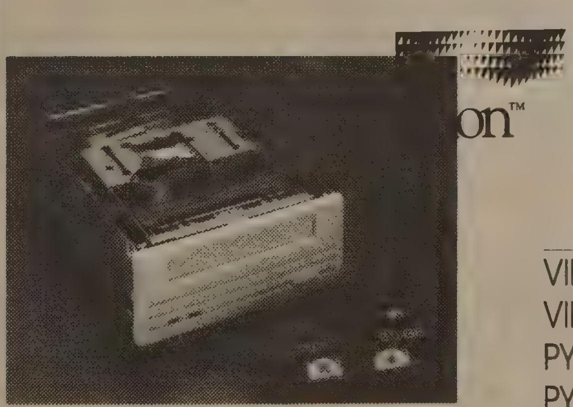

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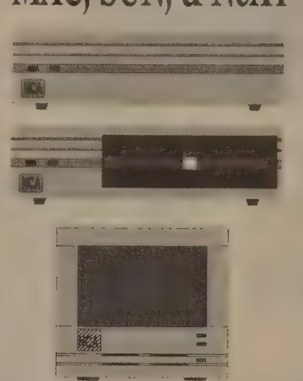

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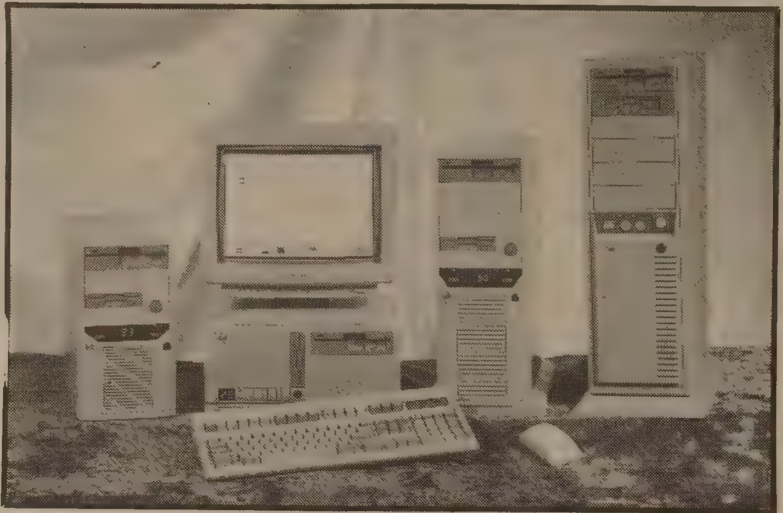

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INFO WORLD

Feb. 24, 1992

486DX-50

"In database server test, the **Axik** surpassed Dell, the previous leader, by 5 percent in transactions per minute (TPM). The **AXIK** was 4 percent faster than ALR. In the previous review, we attributed part of Dell's efficiency to its three-bay drive array. The **Axik** excels in this capacity with only one drive.

"The **Axik ACE** is a superior high-end file server with an extremely low price."

PCComputing

July 1992

486DX2-50

"We liked the Axik more and more over time. Axik Computer's $2,899 Ace Cache 486DX2-50 System minitower was a favorite among our lab testers, who loved its chassis design and couldn't get over its outrageously fast hard drive performance."

PC Sources

July 1992

486DX-50

"A STATE–OF–THE-ART MOTHERBOARD ADDS SPEED"

"Solid components surround an advanced design that offers enhanced bus technology for future expansion. A low price is a bonus.

The 50 MHz 486DX system zips through applications with power and panache. And with the technologically enhanced and expandable motherboard, this system should satisfy your computing needs for years to come."

PC MAGAZINE

June 1992

486DX-50

"AXIK 486-50 BEAT ALL OTHERS ON PRICE, PERFORMANCE & FEATURES"

COMPUTER BUYER'S GUIDE AND HANDBOOK — CBG&H BEST BUY

July 1992

486DX-50

"A GREAT BARGAIN"

"Axik Computers has gone to the trouble to build its own boards—and its home-grown ACE-motherboard-loaded tower system blows the competition out the door"

"RECORD TIMES"

"That's why we run our RealWorld Benchmark Tests twice on the Axik: we didn't believe the results the first time out. For the most part, the Axik's scores were among the lowest (that is, fastest) we've ever seen."

"Flat-out performance doesn't mean much if you're not getting value in other areas. The Axik 486WB/50 uses high-quality components like TEAC and Quantum drives, an Orchid VGA card, and a well-built roomy tower case. "All things considered the Axik at $2,849 isn't just a good deal: It's a fantastic buy!"

PC WORLD BEST BUY

October 1992

486DX2-50

"IS ONE SPEEDY PC"

"The Axik Ace cache 486DX2-50 is one speedy PC, joining the top of the chart. This fairly compact tower has great internal accessibility, 6 slots free, and a generous 8 drive bays. Axik's baby motherboard includes a ZIF socket and a jumpered clock, which enables a 66-MHz 486DX2 migration.

The price adds more polish to the Axik's sheen. With an on-site service option, this fine PC would be an easy Best Buy! " *On-Site Service Is Now Provided FREE!*

COMPUTER SHOPPER

July 1992

486DX-50

"You Can Have It All with the *Ace 486/50*"

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"From the PC connoisseur's viewpoint the most interesting thing about the Axik is its motherboard. Axik makes its own boards, and the company's attention to detail shows"

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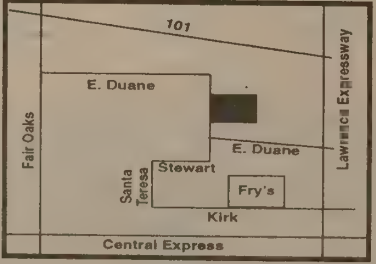

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watch, although your patience may eventually run thin. Vistapro indicates what is being calculated, but the picture does not appear until it is completed.

Each program excels in different areas and both are very easy to use. Vistapro seems to have more features and flexibility. However, it doesn't generate clouds like SA does. These clouds are beautiful! But then, Vistapro can generate beautiful star-filled night skies, which SA can't. SA offers an immediate rough display of the terrain, while Vistapro requires you to do a quick render. Also, although Vistapro supplies more DEM data files, SA's data files are larger and cover more land mass. Bottom line is that these are two wonderful programs and at their bargain prices, you can afford both!

If you've felt you didn't have the talent, but have always wanted to make stunning pictures or animations using your Amiga, these programs were written for you. Create breathtaking mountain scenes or strange new worlds. If you have talent too, it's even better! Though not required, an accelerated Amiga and hard disk are highly recommended. (Virtual Reality Labs, Inc., 2341 Ganador Court, San Luis Obispo, CA 93401. 805/545-8515. Natural Graphics, Inc., PO Box 1963, Rocklin, CA 95677. 916/624-1436)

MACINTOSH SOFTWARE REVIEWS

FUNNY: THE MOVIE IN QUICKTIME

SPORTS ILLUSTRATED CD-ROM SPORTS ALMANAC

Published By: Warner New Media
List Price: $39.99 (Funny: The Movie); $59.99 (Sports Illustrated CD-ROM)
Reviewed By: Matthew Leeds

Warner New Media has been producing innovative and interesting CD-ROM titles, helping to create and fill consumer demand. Their two latest titles unfortunately bring little if anything to the party, and serve best as examples of what not to do in creating a CD-ROM product.

Funny: The Movie in QuickTime is exactly what its title describes: a direct conversion of Bran Ferren's 1989 movie. Ferren asked eighty-four celebrities and non-celebrities to tell the funniest joke or story they had ever heard. If these are the funniest stories they've heard, they've been stuck in a timewarp since the beginning of the century; some of the jokes are that old. While you can select each joke separately via an index (there are several indexes, all visually pretty on-screen but essentially the same), the only value added to the content is an After Dark module that plays QuickTime movies. Save your money and rent the tape.

The *Sports Illustrated* CD-ROM Sports Almanac is a little better, but not much. The only thing it has over a paperback version of the same information is the ability

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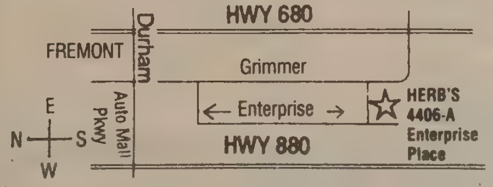

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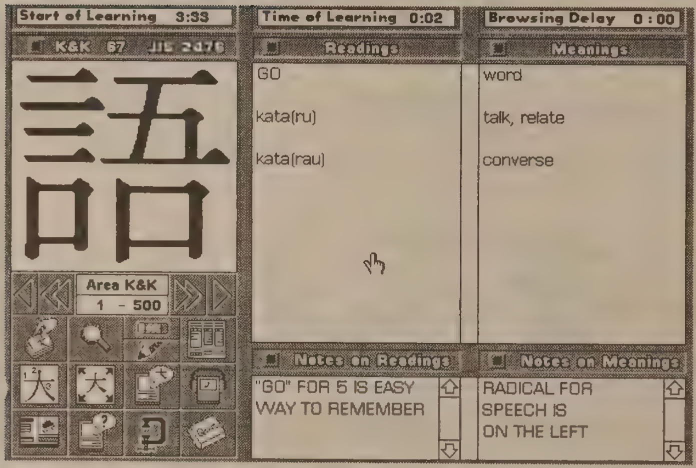
to search by keywords. While it contains articles from *Sports Illustrated*, athletic awards from 1931 forward, highlights from the 1991 sports season, and other info, there's little of the interactive or educational innovation one would expect to find in a CD-ROM product. Again, unless you've got money to burn, buy a paperback almanac and wait for something better. (Warner New Media, 3500 Olive Ave., Burbank, CA 91505)

MAC SUNRISE SCRIPT RELEASE 2.0

Designed By: Wolfgang Hadamitzky
Published By: Stonebridge Press
For: Macintosh (2MB RAM, requires HyperCard 2.0 or higher, up to 72MB of free hard disk space)
List Price: $99/$249/$499 depending on configuration
Reviewed By: Mike Markowitz

Learning Japanese presents formidable difficulties to speakers of Indo-European languages like English. The sound system is relatively simple; only fifty basic syllables, compared to hundreds in English. The rules of grammar are quite regular, but correct usage involves delicate judgments about the social relationship between the speaker and the person addressed. Above all, the writing system of Japanese is stunningly complex and quite alien to users of the Roman alphabet. Evidently, the Japanese writing system works; illiteracy is non-existent in Japan, and Japanese actually tend to read faster than Westerners.



GO — word
kata(ru) — talk, relate
kata(rau) — converse

"GO" FOR 5 IS EASY WAY TO REMEMBER

RADICAL FOR SPEECH IS ON THE LEFT

Many centuries ago Japan borrowed the Chinese ideographs, called kanji in Japanese. About two thousand of these characters are in general use as nouns, adjectives, personal or place names, and the stems of verbs. Each kanji may have several different readings or pronunciations, depending on its context. Alongside the kanji, two syllabic scripts developed: hiragana are used to write native Japanese words and grammatical endings on words written as kanji, while the katakana are mostly used to write words borrowed from Western languages.

If our writing system had evolved along the same path, we might need to learn two thousand Egyptian hieroglyphics for basic words; Anglo-Saxon runes for pronouns, prefixes, and suffixes; and the Roman alphabet for all words derived from Latin.

Mac Sunrise Script is an ambitious attempt to use the Macintosh to facilitate the learning of Japanese writing. It consists of a set of linked HyperCard stacks. At the simplest level you can use the program as a set of electronic flash cards. You can select your own sets of kanji for study, and add notes to the cards. The program includes digitized sound for each word and can also animate the stroke order, which is important for writing kanji correctly. You can set the program to select and display kanji randomly.

Since there is no alphabetical order when you don't have an alphabet, the program includes a sophisticated Search capability based on "graphemes," or common graphic elements.

There are separate stacks for reviewing the hiragana and katakana (which you're supposed to know perfectly by the second or third week of learning Japanese).

The publisher offers three versions, with one hundred, five hundred, and two thousand kanji, respectively. The Japanese Ministry of Education expects kids to master a prescribed list of some eighteen hundred kanji by the time they graduate high school.

Despite its excellent instructional design, Mac Sunrise Script (particularly the full 72MB version) seems impractically large and expensive for all but the wealthiest schools. For an extra $600, the publisher will pre-install the program on a 105MB external hard drive. Site-licensing arrangements can also be negotiated. HyperCard is a rather clumsy environment for such an ambitious project; it could have been much smaller and quicker if it had been written as a standalone application. A more appropriate medium for such a huge application might be CD-ROM. (Stonebridge Press, PO Box 8208, Berkeley, CA 94707. 510/524-8732)

BOOK REVIEWS

DOS 5 USER'S GUIDE: A COMPREHENSIVE GUIDE FOR EVERY PC USER

Author: Dan Gookin
Published By: M&T Books
List Price: $24.95
Reviewed By: Woody Liswood

Now that you are working with DOS 5.0, you might be considering purchasing a book to supplement the documentation, or perhaps even just to help you understand all the features in this new version. You should take a look at *DOS 5 User's Guide.*

This book, although with 771 pages is very complete, is neither highly technical nor advanced. It is designed to give the average user a lucid explanation of the ins and outs of DOS. The presentation is straightforward, with lots of examples about what you should type and what the results might be.

Before jumping into the world of DOS commands, Gookin first discusses your computer, its parts, components, and how each of these work together. This is followed with a discussion about memory, microprocessors, and the care and feeding of disks. I found these sections answered many of the questions that I had back in my beginning DOS days. In fact, if you've got a friend who almost relentlessly asks questions about RAM, ROM, disks, and DOS, this book would make an excellent gift.

Other chapters examine I/O ports, installation, hard drive setup, directories, disaster recovery, and many other topics. This book is well organized. After discussing the DOS prompt, for example, Gookin gets into using the new MS-DOS editor; not a bad sequence for this information since teaching about the editor is a good step before turning to those ubiquitous files called AUTOEXEC.BATand CONFIG.SYS.

The book ends with a complete command reference for all of the DOS commands and the commands which are functional in the various DOS programs. So if you need to know about DOS 5.0, this is a good place to start. (M&T Books, Inc., 501 Galveston Dr., Redwood City, CA 94063)

DVORAK'S GUIDE TO PC TELECOMMUNICATIONS, SECOND EDITION

Authors: John C. Dvorak and Nick Anis
Published By: Osborne/McGraw-Hill
List Price: $39.95 (softcover with diskette, 1128+ pages)
Reviewed By: Bill Gram-Reefer

Intended to be "a complete overview of the world of telecommunications," the second edition of *Dvorak's Guide to PC Telecommunications* is more than a resource book; it is a demonstration of the tremendous development that the computer publishing business and the online world have experienced in only the last couple of years.

You get a good feel for the *Guide* right away by working your way from both ends of the book into its middle. Pasted on the inside front cover, for instance, is a bright yellow diskette jammed with popular PC software including communications, text-processing, compression, and virus protection programs. In the back are money-saving

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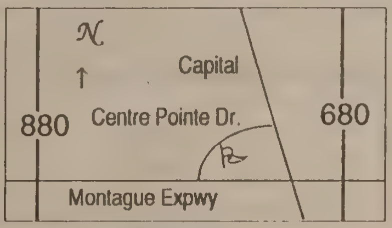

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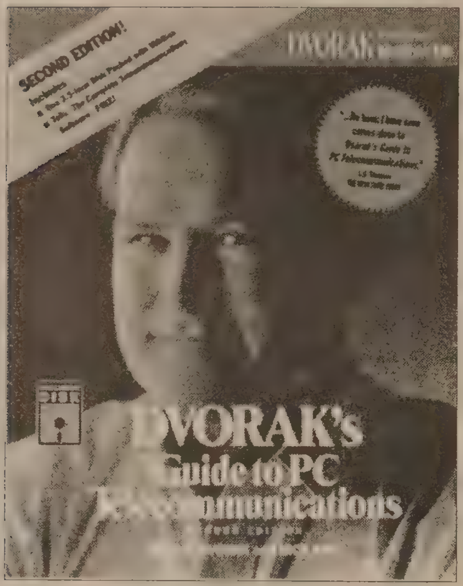
coupons in addition to a first-rate, twenty-five-page index.

The book is divided into seven sections. There is an overview of telecommunications, a primer on modems and software, a summary of bulletin boards and related shareware, details on services and advanced connectivity, information for advanced users, a well-thought-out and -presented 111-page tutorial on how to use the key programs included on the diskette, and appendices. Throughout, the *Guide* successfully educates bold beginners and seasoned pros alike on how to better understand, access, use, and even to have fun with this "new" technology.



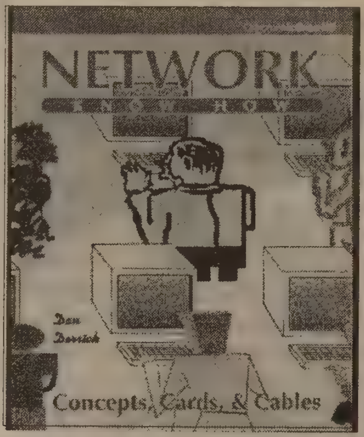
Eight appendices are included. These range from the perfunctory (160 pages of Tymnet, Sprintnet, and CompuServe access numbers; a listing of descriptionless bulletin boards and their numbers; along with a twenty-page directory of modem manufacturers) to more useful fare, including a helpful glossary, cable diagrams, ASCII codes, the AT Command set, and the book's crowning glory, a listing of over one hundred "emoticons," those odd shorthand symbols used to indicate humor :-), smirks :-1, or a wink ;-), if only to illustrate just how clever you really can be when communicating with but a keyboard.

Overall, the *Guide* is a classy presentation of ten years' worth of wit and PC wisdom. The all-new second edition of *Dvorak's Guide to PC Telecommunications* offers more value than most computer books. (Osborne/McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710. 510/548-2805)

NETWORK KNOW-HOW, CONCEPTS, CARDS & CABLES

Written By: Dan Derrick
Published By: Osborne/McGraw-Hill
List Price: $19.95
Reviewed By: Thomas Schlegel

Among PC's used in business environments, Local Area Networks are increasingly the norm rather than the exotic, high-powered exception. Reading *Network Know-How, Concepts, Cards & Cables*, by Dan Derrick, will be helpful to many people who are finding LANs appearing in their lives. If you are on a LAN but no one has explained what is going on, this book will give you a pretty good idea what the LAN is doing; if you think you might want to install a LAN, it will give you a good idea of what a LAN can do for you.



While this is a "how to" book it is not simply a technical guide. Before discussing how to install a network, Derrick discusses how to answer the whether and what questions concerning a network for your particular situation. The book's subtitle, "Concepts, Cards & Cables," is appropriate—concepts as well as hardware are discussed, and concepts come first.

The first chapters discuss the nature of small networks. They help readers assess whether they need a network, and whether they are technically and organizationally ready for a network. (Sadly, there are people with networks, or trying to run networks, who would find the answer to one or both of those questions to be no.) There is a separate chapter, "Can You Install a Network?", that discusses the challenges of network installation and culminates in a checklist that helps the reader decide whether to take on the project.

Though the author makes clear that he is not providing a substitute for manuals, the middle section of the book provides a good discussion of the technical side of setting up a network, from how to check interrupt settings to how to pull cable over walls.

The book ends with a valuable chapter "Working with a Consultant." As with the rest of the book, the reader is not directed but helped through the process. The reader will consider whether to involve a consultant, how to find the right one, and how to manage and evaluate the consultant relationship. I would add that any network consultant would be delighted with a client who had read *Network Know-How, Concepts, Cards & Cables.*

I can strongly recommend *Network Know-How, Concepts, Cards & Cables* to PC users who find themselves trying to cope with the LANing of the PC environment. (Osborne/McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710. 510/548-2805)

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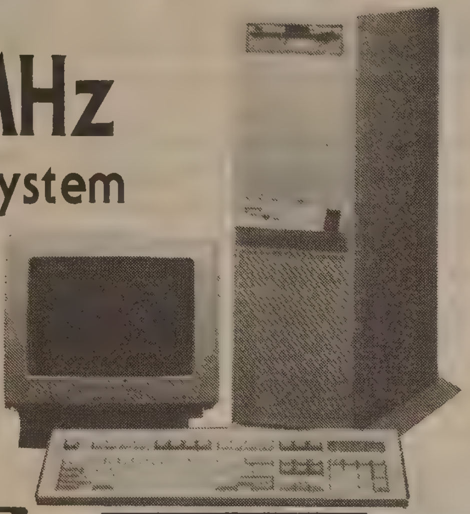

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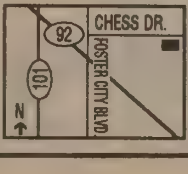

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TRICKS OF THE WINDOWS 3.1 MASTERS

Author: W. Edward Tiley
Published By: SAMS Books
List Price: $44.95
Reviewed By: Birrell Walsh

Microsoft has been taking a lot of flack for not documenting functions for third-party developers. That is no surprise: Microsoft has not documented a lot of things for the end-user, either.

I came across this book when I was quite stumped with Microsoft Windows. I needed to set up an automatic macro, to run some complicated Dynamic Data Exchange connections, and to use an icon editor. I found what I needed in Tiley's book.

It is a compilation of things that you wish Microsoft had told you. It tells you how to organize the desktop and configuration files, manage memory and fonts, and work with Windows on a network. It also helps you use Windows products like Norton's Batch Builder, Borland's Resource Workshop, and Visual Basic.

This is a book for the power user and the departmental computer mentor. Throughout the book, Tiley has included boxed "Master's Tricks." These are ideas you might not have thought of which allow you to optimize Windows for your own use or others' convenience.

Included with the volume is a disk of demo programs, shareware, and freeware utilities. There are demo versions of an icon editor and of the programming language Realizer, for which the book contains some documentation.

Mr. Tiley writes well, and he thinks the way an end-user thinks. There is an excellent index, and a table of contents so systematic—fourteen pages!—that it has its own overview summary.

If you have to decipher Windows, this book will probably pay for itself the first day you use it.

PC SOFTWARE REVIEWS

COMPUTER SELECT CD-ROM DATABASE

Published By: Ziff-Davis
List Price: Standalone version, $995; LAN version, $4495
Reviewed By: Woody Liswood

Well, the first question you must ask yourself in reviewing CD-ROM databases is what are you reviewing? Is it the software which comes on the CD-ROM and allows you to ask questions of the database? Or is it the quality and quantity of the database itself? I have opted for both.

This monthly release contained 161,636 separate articles or identifiable pieces of information. It is divided into categories such as Articles From Computer Periodicals, Hardware Product Specifications, Computer Industry Company Profiles, Glossary of Computer Terms, and User's Guide for Computer Select.

The key to getting to this information is the software. Computer Select comes with Lotus's Bluefish searchware software, release 2.4. This software works through the now trad-itional top bar pull-down type of menu. If you use 1-2-3, you'll pick up and work with this menu without ever needing to go to the User's Guide to see what to do. I found everything about the menu easy to understand and use.

In order, across the screen, you see Titles, Browse, Words, Section, Copy, Print, Utility, Info, and Exit. However, in use, the first thing which appears is Section, because you must always start here to identify which of the sections you want to query to find information. Picking sections shows you a table and lists how many articles are in each section. Highlight that section with the cursor, press return, and you can then browse, look at titles, and search for words.

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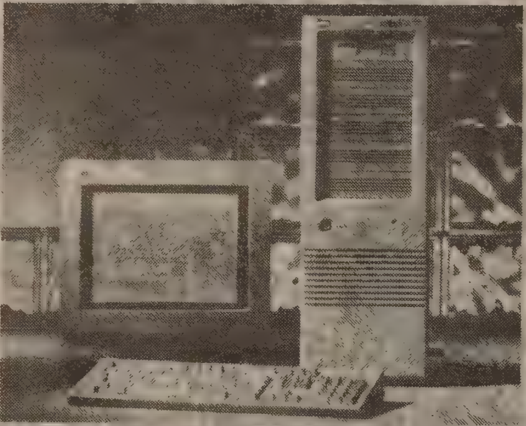

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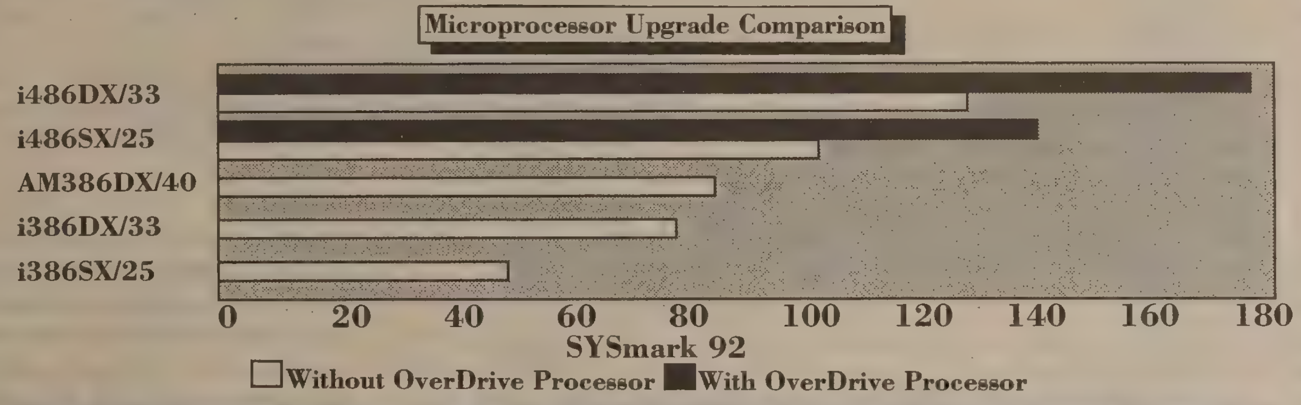

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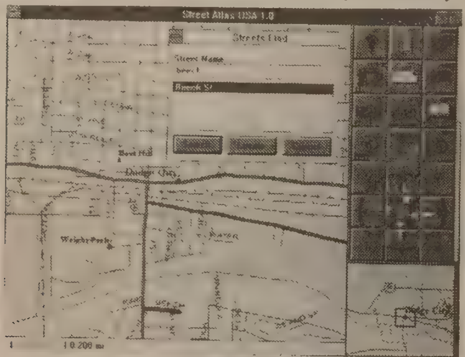
Published By: DeLorme Mapping
List Price: $99
Reviewed By: Woody Liswood

Do you need to locate a street anywhere in the United States? If so, Street Atlas, running under Windows, may be an excellent solution to your needs. On a single CD-ROM, you will find a street map for the United States.

The map shows state and city areas, street addresses, highway and state routes, roads, road names, ponds, streams, and rivers. You can locate a specific area if you know the phone number, the ZIP code, the place name, or street name.

Street Atlas uses "levels" to distinguish between maps. For instance, the map of the United States is a level three. Higher levels, larger numbers, show greater detail, until at level thirteen you can see individual street names. Wherever you click your cursor, Street Atlas centers the map on the screen. Once you are at the level of detail you desire, there are a series of icons that let you move around the map—going to the top, bottom, left, right, northwest, northeast, southwest, and southeast.



This is an extremely easy-to-use product. It comes with no documentation, and none is needed. The instructions are self-contained on the CD.

There is no ability to print your map directly. If you need hard copy, you must save the current screen view to the clipboard, then import that data into some other program.

All in all, a great product, and a very good price. If you need to be able to look up any street quickly, Street Atlas from DeLorme Mapping will do the work. (DeLorme Mapping, Inc., Lower Main St., PO Box 298, Freeport, Maine 04302. 207/865-4171) ■

Continued from page 182

wrote down the structure doesn't know any chemistry, and that's enough to block the further study necessary to understand the system context in which the proposal makes sense.

That's one of the more striking cases in my experience. In fact, the specific chemist I have in mind who made that observation was quoted as saying that in an article. I subsequently talked with him and put him on my doctoral committee.[*laughs*] At the end of which, I gather, he decided that I did know some chemistry.

So do you find that as time has progressed, the academic community is more receptive than it was initially? One of the points in *Unbounding* that really struck home was the statement that any new technology is initially going to attract as many flakes and charlatans as reputable practitioners.

And it will do that in particular if it has large consequences. What you're describing is a pattern that also works with scientists—society trusts scientists to judge new technological proposals, rightly or wrongly. [*laughs*] Many scientists, however, judge new proposals based not on how they look when they're examined, but on how they smell culturally. And if a set of proposals has striking, exciting human consequences, it will stir a fuss, and the fuss will create a stink, and the scientists will turn up their noses.

And therefore we have a systematic mechanism which is very good at rejecting nonsense, that also rejects some of the more important things that are sensible. One of the consequences of this mechanism which is good at rejecting nonsense is that some of the most important long-range developments will be systematically scoffed at, for a while.

It's in part a matter of asking the wrong experts. Asking chemists about molecular manufacturing is like asking transistor designers about computer architectures. Organic chemists work with structures that typically have a few to a few hundred atoms. A simple low-end molecular manufacturing system might have a billion atoms. The gap there is comparable to the gap between a single transistor—an isolated transistor and package, the level of technology in the 1950s—and the kind of VLSI that we're only getting toward today.

So, go to the 1950s. Find someone who is working on growing germanium crystals to make the old germanium transistors, and ask that person to judge proposals for ten-million-transistor-on-a-chip computers, and whether RISC or CISC architectures are preferred. You'll get a blank expression, and the notion of having ten million devices on one piece of semiconductor would seem to be a fantasy.

There's also a major cultural gap between the United States and Japan regarding setting goals, articulating goals. Many Japanese research projects are given extremely ambitious goals. For example, the Kunetaki Molecular Architecture Project speaks of self-organizing, intelligent, self-repairing, etc., etc., etc. molecular systems.

That project is over. It was a five-year project. Did they achieve that? No. On the other hand, what they did was, they set the best direction they could think of, very ambitious. A direction that, if achieved, would lead to enormous payoffs. In that project they took steps in that direction, because that was the direction they'd articulated.

If you judge their achievements relative to the end point of the direction they were pointing, they fall short, and you call it a failure. If instead you ask, "Did they direct their resources better because they chose those goals?" I think the answer is yes.

In the United States we are afraid to articulate ambitious long-term goals, for whatever reasons—in part, the tendency of people to come back two years later and say, "You haven't done it yet, and since you couldn't possibly have been planning ten or twenty years in advance, you must have failed."

Because of those sorts of attitudes we don't articulate ambitious long-term goals. As a result, I believe, we tend to put our research efforts into directions that have, on the average, less long-term payoff, because we're not looking.

I'm not saying that we can predict the outcome of research programs, or that we can predict what will pay off in the future. I'm saying that we do better if we try than if we don't. If we try intelligently than if we don't. Otherwise you're throwing away information, soft information, in favor of hard laboratory data on something that may be uninteresting in the long term.

It's safe to assume that for every glorious lifesaving application of this technology that might come along, there's almost sure to be an equally sinister and destructive one, perhaps developed in some secret government lab. Is that an accurate perception, and if it is, how can people who are interested in nanotechnology keep it from going off to the dark side before it even gets out of the lab?

That's been a subject of a lot of discussion among people who are really concerned with these issues. The policy that people seem to have settled on as making the most sense is to make it clear that yes, among the applications of this manufacturing technology is the manufacturing of systems that are tremendously subject to abuse, things that are inherently tremendously dangerous.

But it's important to more than balance that by focusing on how these capabilities can be used for medicine, increasing wealth per capita while cleaning up the environment, and a whole range of beneficial applications that would naturally occur in the civilian sector, and would naturally encourage international cooperation.

Because at this point, with all that we know of the potential dangers of technology and all the discussion there has been of this one, the potential nightmare scenario is not that we plunge ahead blindly ignoring the dangers and have them take us by surprise. The nightmare scenario is that a focus on the destructive potential of new technologies leads to them being classified as a military technology, leading to international rivalry with a military flavor, and precipitating a war.

The optimistic scenario is one in which we keep in mind, as has happened so far, the potential for abuse, and the things that would be dangerous if you did them, and consider how we can avoid doing anything like that, while focusing on goals that encourage cooperation. ■

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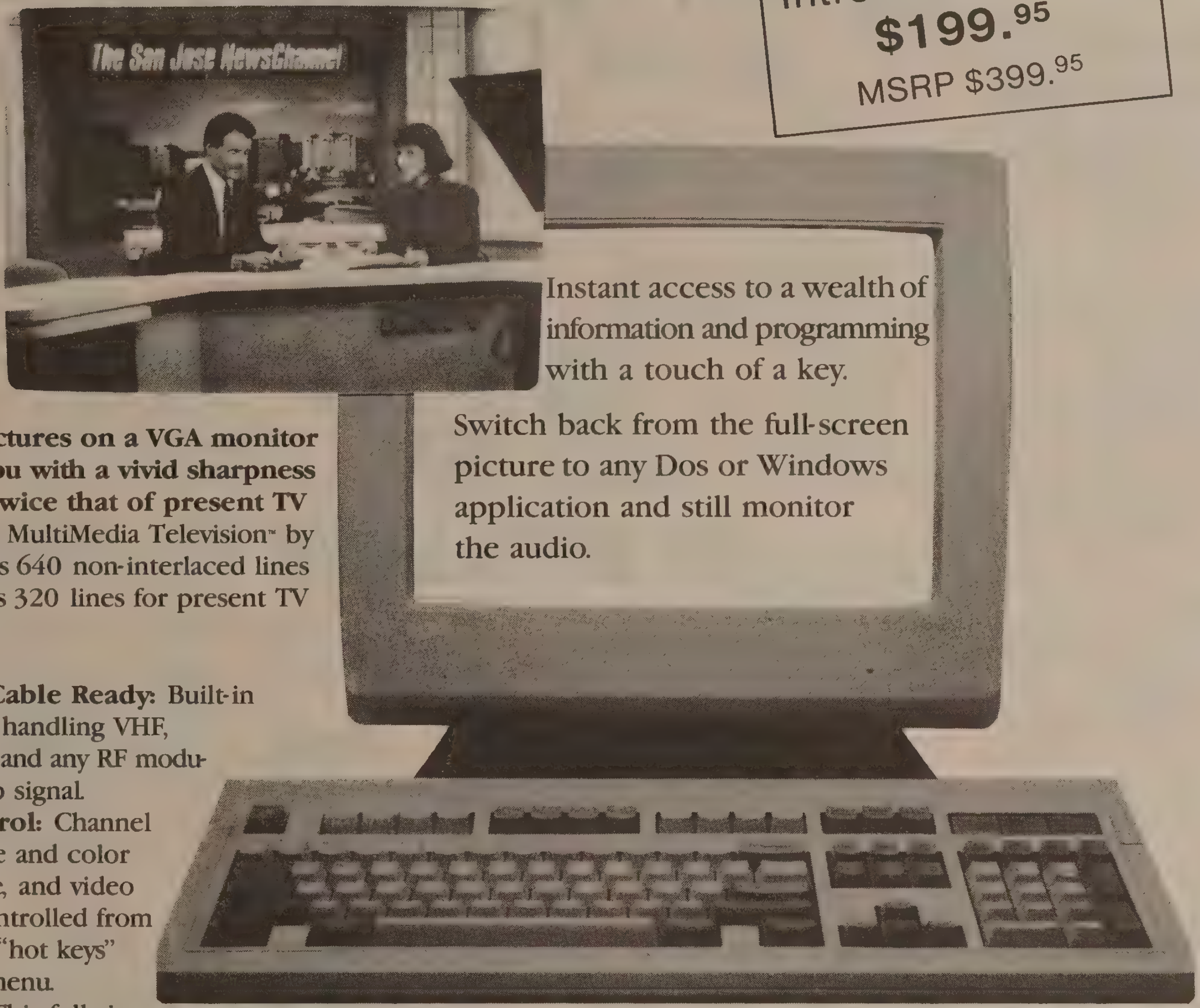

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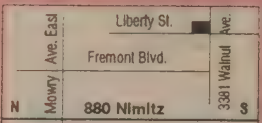

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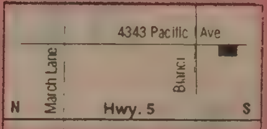

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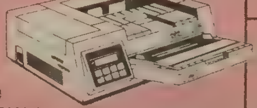

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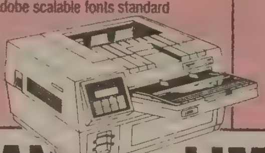

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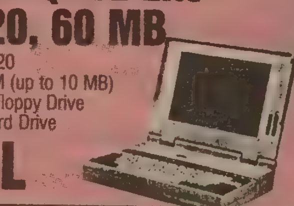

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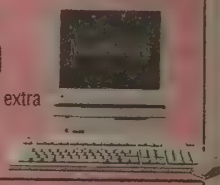

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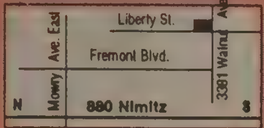

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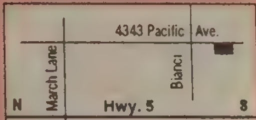

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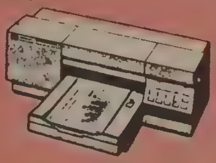

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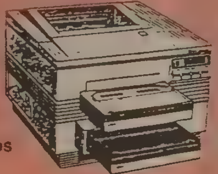

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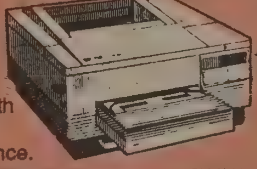

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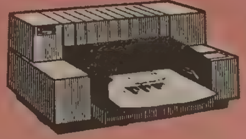

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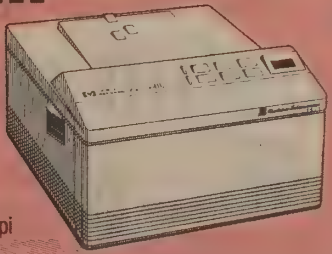

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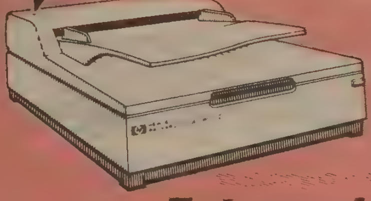

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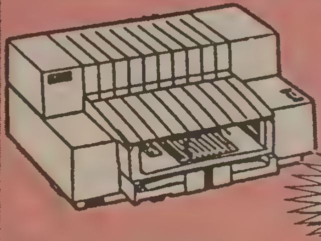

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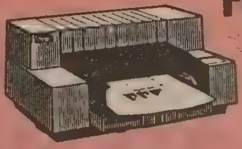

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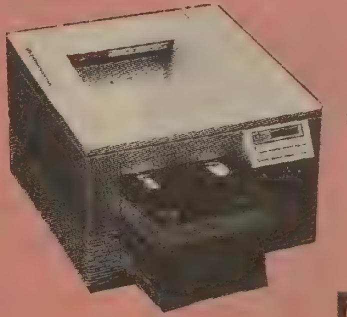

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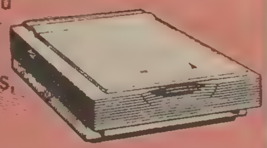

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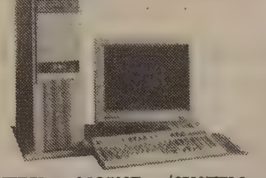

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- 101 Keyboard
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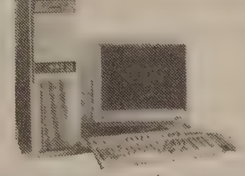

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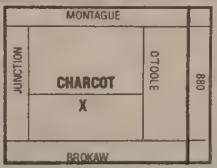

Continued from page 74

classification, vendor names, check numbers, dates, and other classifications. When he wants to determine how much was spent on maintenance, he can search for all transactions within a date range and generate a report. I suggested to Howard that he use accounting software instead, but he would have none of it. "I like my database setup. It gets the job done, I'm familiar with it. If it ain't broke, why fix it?"

Part of any accounting system is manipulating the database. Indeed, many accounting packages run on top of a database engine. While the database keeps track of the transactions, the accounting program is responsible for the interface and report presentation. However, I would not recommend using a database, or a spreadsheet, in lieu of a dedicated accounting package, even for the simplest accounting needs.

Databases and spreadsheets lack basic accounting controls. They could therefore appear to be functioning properly if they merely carry out their instructions correctly, even if there is a logical flaw in the setup.

Unlike accounting software, neither a database nor spreadsheet is self-balancing—they don't make debits equal credits. If an entry "disappears," it can be time-consuming to find out why the books are out of balance. And if the books are out of balance, it may not be readily apparent.

Accounting software has built-in functions which can be accomplished with a database, but would require "reinvent the wheel" function programming by the user. For example, even low-end accounting packages, such as DacEasy and Peachtree, are equipped with a financial report writer. It should not be necessary for the end-user to have to write these reports from scratch.

Also, even low-end software provides functions and conveniences not included in any database or spreadsheet program that I am familiar with. Typical capabilities of accounting software include check generation, automatic bill payment, and automatic bank reconciliation.

It will be easier for the next person to step in and take over if the accounting records are maintained on standard accounting software. This point was driven home when Marian took charge of the books for her twenty-unit condominium complex. Her association had also used the pen and pencil technique of accounting until she confidently took charge. As office manager for a dentist, Marian had been using Paradox, a relational database package, to keep the books, patient mailing list, and her Roladex information. With this knowledge, she rolled up her sleeves and invested a couple weekends in computerizing the association's records.

Sure enough, the records looked great that year. But the next year was Anthony's watch. Anthony had never used Paradox and had trouble learning it. He procrastinated when it came to data entry. When the board of directors decided they wanted to change the design of certain reports and wanted to include a new field with certain records, Anthony was at a complete loss; meanwhile, Marian had moved away.

Entering transactions on a spreadsheet can be particularly slow, and each aspect of entry must be done manually. In contrast, with a simple accounting program, reconciling the bank statement is an automated procedure requiring not much more than highlighting checks and deposits which have cleared. Even a simple accounting program will generate nicely formatted financial reports with a minimum of effort. Transactions can be accumulated, summarized, or detailed in financial format with just a few keystrokes.

RECOMMENDED ACCOUNTING PACKAGES

The Windows environment is especially appropriate for situations in which a non-expert is given the bookkeeping responsibility. Many users are already comfortable in this environment, and the recommended 386-based system has become relatively inexpensive. Low-end accounting software written for Windows is generally more capable and easier to use than comparable DOS packages, particularly for a person with relatively little exposure to computer work.

QuickBooks by Intuit (reviewed in the August 31, 1992, *MicroTimes*) should certainly be considered. QuickBooks is presently a DOS-only package but has an interface intended for someone without accounting experience. It tracks payables and receivables. This is especially important for homeowners' associations, because their operating statement must include a schedule of assessments received and receivable identified by the unit/lot owner.

Another useful attribute of QuickBooks is that it doesn't do what you don't need done. There are no inventory or advanced report writing capabilities. It'll keep the necessary records but it won't boggle the mind.

Another accounting package designed for the non-specialist is M.Y.O.B., by Teleware, Inc. The main menu is a flowchart; you click through the chart and it walks you through the program, a step at a time. Unlike QuickBooks, in which entries can be altered at whim without leaving a trail, M.Y.O.B. automatically generates a few basic reports at the time of data entry which can be used as an audit trail.

Setting up the accounting system for homeowners' associations is a relatively simple task.

M.Y.O.B. has some features which one wouldn't think would be used by a homeowners' association, such as inventory and simplified job costing. On the other hand, there are situations where these capabilities could be useful. For example, substantial repair projects could be charged to a job code.

Simply Accounting for Windows, by Computer Associates, is a low-end package with more capabilities than most. Once it's set up and running, it is especially easy to use, owing to the clean design of its interface.

Teknon is an entry-level accounting package running under DOS but with its own windowing environment. It's easy to set up and use. Like QuickBooks, it does not have an inventory function. You can easily enter hand-checks and automatically enter recurring bills. Teknon offers a graphical interface's ease of use without the hardware and software requirements of Windows.

Setting up the accounting system for homeowners' associations is a relatively simple task. The chart of accounts (a list of income and expense categories as well as assets and liabilities), is usually straightforward. Many accounting software packages come with a preformatted chart of accounts which the user modifies as needed. For most purposes, only a minimum amount of modification is necessary.

A general guideline to use when selecting a package for your homeowners' association is that it should be fairly clear how to use the software to print checks, code transactions to the appropriate department, and reconcile the bank statement. Especially if responsibilities for these tasks are shared, it should be easy for a new person to step in, and certainly simpler than trying to figure out someone else's spreadsheet format. ■

Resources:

California Condominium Handbook
John Paul Hanna
Bankroft/Whitney
Publishers

Advising California Condominium and Homeowners Associations
Sproul and Rosenberry
Continuing Education
of the Bar
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QuickBooks
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M.Y.O.B.
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Simply Accounting
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International, Inc.
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San Jose, CA 95131
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Peachtree Software, Inc.
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Norcross, GA 30093
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Teknon Accounting
Teknon Corp.
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Rd.
Scottsdale, AZ 85258
1-800-899-8603

DacEasy Accounting
Dac Easy, Inc.
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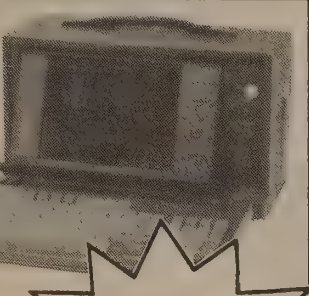

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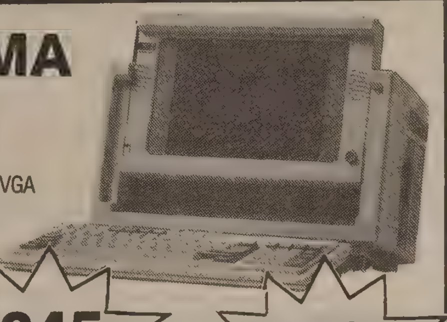

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- MULTI I/O (2S/1P/1G)
- AT CASE w/200 WATT P.S.
- ENHANCED 101 KEYBOARD

KEYBOARDS

Enhanced 101 Click (baby)	$29
MTEK 104 (click)	38
Maxi-Switch 101	35
Omnikey Ultra 130	99
Omnikey 101/102	69
BTC 101	25

COMPUTER CHASSIS

Slide-In Case w/200W PS	$69
Mini-Tower w/200W PS	59
Med-Tower w/200W PS	85
Big-Tower w/300W PS	445
Full Tower w/230W PS	115

POWER SUPPLY

230W XT/AT	$45
285W AT	55
300W AT	65
200W AT	39

LAN Network Interface Cards:

Ethernet 8/16 Bit	$115/145
Arcnet 8/16 Bit	65/125

EPROM PROGRAMMERS

EPROM Programmer, EW-901B (1 Port)	$95
EPROM Programmer, EW-904B (4 Ports)	125
EPROM Programmer, EW-701 (1 Port)	125
EPROM Programmer, EW-704 (4 Ports)	160
EPROM Programmer, EW-708 (8 Ports)	235
EPROM Eraser (with Timer, 15 Chips)	90
Universal Programmer & Tester Expro-60	525

HARD DISK SPECIALS

HH1050 44 MB MFM	$180
Conner 40 MB IDE	175
Conner 120 MB 19ms IDE	285
Conner 170 MB IDE	345
Conner 200 MB 19ms IDE	485
Conner 500 MB SCSI	1050
Maxtor 130 MB 16ms IDE	310
Maxtor 210 MB IDE	415

CONTROLLER CARDS

MFM 1:1 Controller 16 Bit	$45
IDE I/O	25
AT I/O (2S/1P)	12
IDE Card	14

MONITORS & DISPLAY CARDS

12″/14″ Mono	$79/95
Super VGA 0.28 1024x768	265
Oak VGA Card 16 Bit, 256K	35
Trident Super VGA 16 Bit, 1 MB	69
Nanao 16″ 9070U	945
Sony 1304HG 14″	585
Impression 14″ Super VGA	275
Impression 14″ Non-Interlace	315

WINDOWS ACCELERATOR

20X Faster than SVGA w/Primus Technology P2000	$159

LAN Network Interface Cards:

Ethernet 8/16 Bit	$115/145
Arcnet 8/16 Bit	65/125

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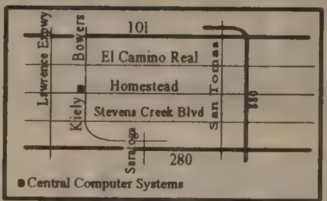

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SPECIAL OF THE MONTH :

3COM 3C503 TP 8 Bit Adapter	***$ 199***
APPOINT Mouse Pen Pro	***59***
Thumberlina	***59***

SOFTWARE :

Borland dBase IV 1.5	***$439***
Quattro Pro 4.0	***235***
Quattro Pro 3.0 + upgrade	***199***
Lotus 1-2-3 For Window	***325***
DR DOS 6.0	***45***

I BASIC SYSEMS

ORCHID
(CAD STATION)

486-33 ISA 256K cache
4 MB, TEAC 1.2 FD
Maxtor 130 MB HD, IDE Controller, 2S 1P
Mid Tower Case w/ 220W
Mitsumi 101 Keyboard
AOC 336 1024x768, .28, NI
Fahrenheit 1280-D 1MB VGA
MS Serial Mouse

MS DOS 5.0 & Windows 3.1	2215

MICRONICS
COMPUTERS INC.

1 MB, TEAC 1.2 FD
IDE Controller, 2S 1P
Baby AT Case w/ 200W
Mitsumi 101 Keyboard
MS Serial Mouse
MS DOS 5.0 & Windows 3.1

486-50 EISA 256K cache	1925
486-50 ISA 256K cache	1625
486-33 EISA 256K cache	1555
486-33 ISA 256K cache	1195
386-33 Gemini 64K cache	845
386SX-20 Gemini 64K cache	645

NICE
(MADE IN U.S.A).

1 MB, TEAC 1.2 MB FD
IDE Controller, 2S 1P
Baby AT Case w/ 200W
Mitsumi 101 Keyboard
MS DOS 5.0 & Windows 3.1
MS Serial Mouse

486-50 EISA 256K cache	1525
486-50 ISA 256K cache	1275
486-33 ISA 64K cache	1085

II HARDWARE

1 CD ROM

ATI Stereo FX w/ speaker	115
CD Caddy / Sony CD Caddy	9.50/12
Speakers	25
MEDIA VISION	
Multimedia Upgrade Kit w/ pro audio spectrum 16, NEC CDR-84J	925
Pro Audio Spectrum 16	199
NEC	
CDR-74 CD ROM 280ms, 300Kb/s, ext	599
CDR-84 CD ROM 280ms, 300Kb/s, int	545
Interface kit for PC	89
Multimedia Upgrade Kit w/ CDR-74	1075
Multimedia Upgrade Kit w/ CDR-84	995
SONY (with controller, no software)	
CDU 535-01 380ms SONY BUS int, hf ht	379
CDU 7205 380ms SONY BUS ext, hf ht	545
CDU 541-01 380ms True SCSI BUS int hf	515
CDU 541-01 without controller	425
CDU 7211 380ms True SCSI BUS ext hf	635
CDU 7211 without controller	555
Sound Blaster Pro CD-ROM Upgrade Kit	
w/ 4 CD titles (no Sound Blaster Pro), int	355
MIDI Kit	59
Multimedia Kit w/ 6 CD titles, int	525
Sound Blaster/ Sound Blaster Pro	97/189
Sound Blaster Pro Basic	155
Creative Lab Video Blaster	349
TEXEL	
DM-3024 265ms int.	449
DM-5024 265ms ext.	529
CD SOFTWARE	
Microsoft Multimedia Development Kit	299
Amazing Universe / Amanda Story	55
American Business Phone Book	69
Atlas Pack (World & US)/ Atlas U.S. President	39
Barney Bear goes to School	32
Battle Chess Multimedia	49
Beauty & the Beast	39
Britannica Family Choice	79
Cautious Condor	49
CD Game Pack II	29
Compton's Family Encyclopedia	199
Corel Draw Artshow 1991	65
Dr.T's Composer Quest	59
Electronic Library	69
Greatest Books Collection	45
Grolier's New Multimedia Encyclopedia	215
Illustrated Encyclopedia 2.0	55
Loom	42
King Quest V	49
Mammals	36
Mavis Beacon Teaches Typing	49
Microsoft Multimedia Beethoven 9th symphony	55
Microsoft Multimedia Bookshelf Win/ DOS	126
Mixed-up Mother Goose	39/49
Monkey Island	39/49
Multimedia Family Bible	45
Murder Makes Stranger Dead Fellows	49
Newsbytes (Computer Industries 83-91)	89
Phoenix Shareware	45
Prescription Drugs	65
Publish It (desktop publishing)	59
Reference Library	45
Sante (For Good Health)	65
Secret Weapons of the Luftwaffe	45
Shakespeare	35
Sherlock Holmes	29/49
Sleeping Beauty / Peter & the Wolf	39
Street Atlas (Delorme)	115
The Family Doctor	59
Time Compac Almanac	59
Time Table of History / US History	49
Ultima 1-6 / Ultima Shareware	45/55
US Presidents	45
Voyage to the Stars	59
Where in the World is Carmen Sandiego	65
Wing Commander Crusade	55

2 CASES

AT Case W/200W Power	$98
Baby AT w/ 200W Power	79
Baby Tower w/ 200W Power	85
Mid Tower w/ 220W Power	105
Full Tower with 250W Power	139
Black Full Tower w/ 300W Power	225
White Full Tower W/300W Power	199
Slim Case w/ 200W (2 drive bay)	95
WorkStation Case w/ 60W (1 drive bay)	95
Hard Disk Drive External Casing	
2 half ht or 1 full ht, 60W, 11lbs	119
3 half ht or 2 full ht, 60W, 13lbs	139
1 half ht for SCSI for Mac, 40W	99
2 half ht or 1 full ht for SCSI for Mac, 60W	139
4 half ht or 2 full ht for SCSI for Mac, 180W	229

3 CONTROLLERS

4 Floppies w/ IDE controller for AT	$45
IDE controller for AT	23
Speedstor Plus w/ SCSI controller	75
WA-6 1:1 MFM (Western Digital chipset)	59
ACCULOGIC	
sIDE-2 (2 IDE hard drive only)	26
sIDE-3 (2 FD & 2 IDE HD)	29
sIDE-4 (2 FD & 2 IDE HD, 2S & 1P)	49
ADAPTEC	
1522K SCSI w/ kit (3MB/s)	159
1542B SCSI w/ kit (10MB/s)	269
1542B Plus w/ ASW 310 & ASW 410	339
1640 SCSI w/ kit for MCA	335
1742A SCSI EISA w/ kit (2F & 2H)	459
ASW-1410 ASPI MS-DOS Manager v3.0	79
ASW-310 Sy-Tos Plus (Tape BackUp software)	99
ASW-410 CD-ROM driver v2.1	79
ALWAY TECHNOLOGY	
IN 2000 High Performance 16 Bit SCSI	189
AMI	
SCSI EISA Cache	599
DTC	
3280 SCSI controller	105
3290AS EISA SCSI host adapter	479
6282 1:1 ESDI	125
7287 1:1 RLL	73
FUTURE DOMAIN SCSI Controller	
TMC 1660 for AT (H only) controller only	139
TMC 1660 for AT (H only) w/ kit	229
TMC 1680 for AT (4F & H) (15MB/s) controller only	169
TMC 1680 for AT (4F & H) w/ kit	259
KOUWELL	
Floppy controller (XT)	18
4 Floppies controller (XT,AT)	33
IDE controller	27
IDE controller w/ AT I/O (2S 1P 1G)	39
MICROSOLUTIONS	
CompatiCard IV 4-Floppies Controller (2 ext) 360K/720K/1.2MB/1.44MB/2.88MB FD	115
MYLEX	
DCE 376 EISA SCSI controller w/ 4MB cache	775
ORCHID	
VLB (VESA Local Bus) IDE cont. (2HD,2FD)	call
ULTRASTOR	
ULT 12F/24 ESDI 32K cache	165
ULT 12C/1 ESDI 1MB cache	455
ULT 22CA ESDI EISA 64Kcache	635
ULT 15C IDE cache	239
ULT 14F SCSI 32K cache	239
ULT 24F SCSI EISA 64K cache	459

4 DIGITIZERS

SummaSketch II Plus 12x12, 4 button & pen	299
SummaSketch II Plus 12x12, 16 button	299
SummaSketch II Plus 12x18, 16 button	495
Unitech KD-4000 12x12, 4 button, 4 templates	179

5 DRIVES

Frame for 3.5" Hard Drive and Floppy Drive	**8**
Removable Hard Drive Case for 3.5" HD	49
Hard Disk Drive External Casing	see #2

HARD DRIVES

CONNER	
CP-3000 40MB 25ms IDE 3.5", 1" ht	175
CP-30104 120MB 19ms IDE 3.5", 1" ht	295
CP30174E 170MB 18ms IDE 3.5, 1" ht	335
CP-30204 200MB 12ms IDE 256K 1" ht	419
CP-3544 500MB 12ms IDE 1" ht	945
FUJITSU **(5 years warranty by manufacturer)**	
M2623S 428MB 12ms SCSI 3.5"	955
M2624FA 525 MB 12ms SCSI	1045
M2263FA 680MB 16ms SCSI 5.25" full	1255
M2266FA 1.2GB 15ms SCSI 5.25" full	1635
MAXTOR	
8760-760H 676MB 16ms ESDI 5.25" full	1155
MXT-7080A 80MB 17ms IDE 3.5" 32K cache	249
MXT-7120A 130MB 15ms IDE 3.5"	299
MXT-7213A 213MB 15ms IDE 3.5", 1" ht	399
LXT 340A 340MB 13ms IDE 3.5"	699
LXT 535A 535 MB 13ms IDE 3.5"	1015
LXT 7120S 130MB 15ms SCSI	325
LXT 213SY 200MB 15ms SCSI 3.5"	539
LXT 340S 340MB 13ms SCSI	739
LXT 535S 535 MB 13ms SCSI	1035
8760S-760 676MB 16ms SCSI 5.25" full	1175
PO-12 1.2GB 13ms SCSI	1520
PI-17S 1.7GB 13ms SCSI	1850
MICRO SOLUTIONS (External Hard Drive)	
40MB External Drive (printer port)	345
100MB External Drve (printer port)	455
PLUS DEVELOPMENT (Hard Card)	
Hardcard II XL 50 50MB, 9ms	249
Hardcard II XL 105 105MB, 9ms	399
QUANTUM	
LPS-120AT 120MB 16ms IDE 256K cache	315
LPS-240AT 244MB 16ms IDE 256K cahce	499
LPS-105S 105MB 17ms SCSI 64K cache	349
LPS-120S 120MB 16ms SCSI 256K cache	379
LPS-240S 244MB 16ms SCSI 256K cache	629
PRO-425S 425MB 14ms SCSI 64K cache	895
SEAGATE	
ST-351A 40MB 28ms IDE 3.5"	175
ST-3144A 130MB 15ms IDE 3.5"	295
SYSGEN **(Extenal Hard Drive)**	
42 MB External Drive (printer port)	309
84 MB External Drive (printer port)	395
124MB External Drive (printer port)	489

FLOPPY DRIVES

MICRO SOLUTIONS (External Floppy Drive)	
1.2, 1.44, 360K & 720K (printer port)	189
2.88, 1.2 & 720K (printer port)	215
SYQUEST	
SQ44i 44MB internal	319
SQ44e 44MB external w/ controll & cartridge	519
SQ400 44MB removable cartridge	79
SQ800 88MB removable cartridge	119
SYSGEN (External Floppy Drive)	
Portable EasyFloppy 3.5"/5.25" for laptop & PC 1.2, 1.44, 360K, 720K (printer port)	159
ISA ext. Floppy w/ controller 1.44, 1.2	139
ISA ext. Floppy w/ controller 2.88	179
Floptical Drive 21MB w/ controller	299
TEAC (Floppy Drive)	
360K 5.25"	59
1.2MB 5.25"	57
1.44MB 3.5" w/ frame	55
2.8MB 3.5" w/ frame	95
Dual Floppy Drive 1.2MB & 1.44MB	149

6 FAX MACHINE

SHARP	
FO-216 automatic paper cutter	452
FO-334 remote retrieval	555

7 I/O CARDS

EVEREX	
Magic AT I/O (1S 1P)	$49
Magic AT I/O w/ Game port (1S 1P 1G)	57
Magic AT I/O Plus (w/16550UART) (1S 1P)	62
Second serial port for above AT I/O cards	25
KOUWELL	
2S 1P 1G w/ NS16550AFN chipset (XT, AT)	55
4 Serial ports card	79
AT I/O (2S 1P) / AT I/O (2S 2P)	27/33
AT I/O w/ IDE (2S 1P 1G)	39
Printer Card / Serial Card (XT, AT)	15/15
QUICKPATH	
13 port Multi-function Cont (2 IDE,4F,4S,2P,1G)	89
13 port I/O w/4-16550UARTS (2 IDE,4F,4S,2P,1G)	125
STB 4-COM, **4S w/16554, support** COM 1-8, IRQ 2,3,4,5,10,11,12,15	109

8 KEYBOARDS

FOCUS	
2001 101 click	$45
8000 111 w/ calculator	49
5001 130 keys w/ cursor accelerator	64
NORTHGATE OMNI	
101S	55
101NI /102	69
Ultra T or F	95
SIIG (click)	
Suntouch Jr. 84-key mini keyboard	49
Suntouch 101	57
OTHERS	
BTC 84-key mini keyboard	39
KEYTRONIC 101	45
MAXI 101	35
MITSUMI 101	35
Monterey 101	30

9 MATH CO-PRO, CPU

CHIP TECHNOLOGY	
80387-SX16/SX20/SX25	78
80387-DX25/DX33	98
80387-DX40	125
CYRIX	
83S87 - SX16/SX20 / SX25	78
83D87 -25/33/40	98/98/125
INTEL (CPU)	
Cooling Fan (heat sink)	25.50
386DX - 25 CPU/33 CPU	95/99
386DX - 40 AMD CPU	99
486DX - 33 CPU/50 CPU	call
ULSI	
387-40/33/25	95/75/75

10 MEMORY CARDS

ACCULOGIC	
RAMpAT! up to 16MB(SIMM),16 bit(AT)	$99
SIMM-ply Ram 8/16 bit, 8MB (SIMM) max, XT,AT	145
SIMM-ply Ram 16 bit, 8MB max,PS/2-50,60	169
SIMM-ply Ram 32bit,8MB max,PS/2-70,80	179
EVEREX (all come 0K on board)	
XT 2MB, EMS	55
Ram 3000 Deluxe (up to 3MB, EMS, for AT)	84
Ram 8000 (up to 8MB, EMS, for AT)	165
Ram 10000 (up to 10MB, EMS, for AT)	125
Ram II 4000 (PS/2-5,6,7,80)	175
INTEL	
Above Board w/ 512K	249

11 MEMORY CHIPS

DRAM	
1 MB x 1 - 80 ns	$3.99
256K - 80 ns	1.09
256K x 4 - 80 ns	4.29
64K - 100 ns	1.09
64K x 4 -80 ns	1.65
SIMM	
4 MB x 9 - 60 / 70 / 80 ns	129/119/109
1 MB x 9 - 60 / 70 / 80 ns	33/31/29
256K x 9 - 80 ns	10
Mac : 1 MB x 8 - 80 ns	32
4 MB x 8 - 70 / 80 ns	115/105
PS/2 : 256K x 36 = 1MB	59
512K x 36 = 2MB	109
1MB x 36 = 4MB	139
2MB x 36 = 8MB	269

SEE MORE ON THE NEXT PAGE

PP

MB x 9 - 80 ns	37
56K x 9 - 80 ns	12

NGSTON MEMORY for

ople, AST, AT&T, Compaq,IBM,Nec,Sun	call

SER PRINTER MEMORY UPGRADE

r HP and Panasonic	see #10 or # 20

12 MODEMS & FAX

nnexx 108 Connects modem to any telephone	$119
mm-panion Pocket Fax Modem 96/24	129
artConnect 9624i Fax Modem	75

Tech

llet Modem 9696M v.32,v.42bis int./ext.	295/325
mate Pocket Fax Modem (with Software) P1496MX / P9696MX	319/295

'EREX

vercom 9600 v.32,v.42,v.42bis,MNP5 Int	395
vercom 2400 Baud External w/ MNP5	169

ECOM

ax 96 w/ 1 Liner & Far Fetch Fax	135
ax 96 & modem for DOS	119
ax 96 w/ 1L&FFF & modem for DOS	169

AYES

ptima 96 v.32,v.42,v.42bis, MNP 5, Ext	389
ocket edition 2400 w/ Smartcom EZ	129
martModem 2400B Internal	245
martModem 2400B External	285
tra 96 v.32,v.32,v.42,v.42bis,MNP5 Ext.	635
tra 144 v.32,v.32,v.32bis,v.42,v.42bis, MNP5, Ext	769
-series SmartModem 9600 v.42,v.42bis,MNP5,Ext.	499

TEL

4400EX v.32,v.32bis,v.42,v.42bis Ext	475
axability Plus/OCR for Windows upgrade	115
atisFaxtion Modem/100 w/FAXability s/w internal 96/24 fax modem, v.22 bis, v.22 A/B, fax from Dos/Win application WYPIWYF	105
atisFaxtion Modem/200 w/FAXability s/w internal 96/24 fax modem,v.42,v.42bis, MNP5,fax from DOS/Win application Smart line sharing, Smart UART buffering, WYPIWYF	299
atisFaxtion Modem/400 w/FAXability s/w internal 96/144 fax modemv.32,v.32bis, v.42,v.42bis,MNP5, fax fromDOS/Win application,smart UART buffering, smart line sharing, WYPIWYF	435
atisFaxtion Modem/400e external, 4K data buffer,WYPIWYF	499

ACRONIX

axLite 96/24 fax modem, int.	88
axLite 96/PC pocket fax modem v.32,v.42, v.42bis, MNP5, w/ WinFax software	329
axLite 144/PC pocket fax modem v.32bis, v.42, v.42bis, MNP5, w/ WinFax software	385

RACTICAL PERIPHERALS

M14400FX96 (14.4 modem 96 fax) v.32bis, int	369
M14400FX96SA v.32bis, ext.	439

S ROBOTICS

ourier 144 v.32,v.32bis,v.42,v42bis,MNP5, Int	535
ourier 144 v.32,v.32bis,v.42,v42bis,MNP5, Ext	555
ourier HST-DS 144 v.32,v.32bis,v.42,v.42bis,MNP5, Ext	775
portster 2400 modem w/ Sierra Game int/ext	99/109
portster 96 Modem MNP5 Int/Ext	259/289
portster 9696 FAX MNP5, Int/Ext	289/319
portster 14.4 v.32bis, v.42bis, Int/Ext	309/339
portster 96/14.4 FAX MNP5, Int/Ext	319/349
hared Access Modem Sharing Kit	675

LTRIX

400 baud modem w/ MNP5, Int	49
5/24 send & receive fax/modem w/ MNP5, Int	75
5/24 fax/modem MNP5 v.42, Int	105
ocket send & receive fax/modem, Ext	139

OM

end 96 Rec. 48 modem 2400 Int / Ext	95/115
C9624V (int.)/FX9624V (ext.)	135/155
5/96 fax modem v.32, v.42bis, MNP5 Int / Ext	245/265
4/144 fax modem Int / Ext	299/329

13 MONITORS

VGA mono paper white	135

IC

M 1412 14" Mono paper white	95
M 1417 14" 1024x768 VGA paper white	115
M 1428 14" 1024x768 .28	289
M 1439 14" 1024x768 .39	249

OLDSTAR

460 Plus 14" 1024x768	289

ATSUSHITA (VIEWSONIC)

ewsonic 1 14", 640x480, .39, Int	235
ewSonic 4e 14" , 1024x768, .28, Int.	315
iewSonic 5+ 14", 1024x768, .25, NI	525
ewSonic 5e 14", 1024x768, .28, NI	425
ewSonic 6e 14", 1024x768, .28, NI	355
iewSonic 6FS 15", 1024x768, .28	629
iewSonic 7 17", 1280x1024, .28, NI	1075
iewSonic 8 20", 1280x1024, .31, NI	1595

MITSUBISHI (w/ base)

HL6605ATK 16", 1280x1024, NI	925
HL6955SETK 20", 1280x1024, .31, NI	1745
BNC Cable	39
TFS 6705 17" 1024x1024, .26, NI	1055

NANAO

9070U 16", 1024x768, .28 NI	775
9080i 16", 1280x1024, .28 NI	955
T560i 17", 1280x1024, .25, NI	1895
F550i 17", 1280x1024, .28, NI	1175
T660 20", 1280x1024, .31 NI	1825
T660i 20", 1280x1024, .31, NI, Trinitron	2595

NEC

3FGX 15", 1024x768, .28	649
4FG 15" Flat, 1024x768, .28, NI	749
5FG 17" Flat,1280x1024, .28, NI	1375
5D 20" 1280x1024, .31, NI	1595
6FG 21" Flat, 1280x1024, .28	2595
Monitor Lens (Anti-reflection, Anti-static) for 4FG / 5FG / 6FG	74/115/185

PANASONIC

C1381i 14" Super VGA, 1024x768, .28, Int	325
C1395 14" 1024x768, .28, NI	435
C1991 20" 1024x768, .31, NI	1485

POWER II

3E 14" Super VGA, 1024x768, .28, Int	285
4A 14"Multisync, 1024x768, .28, NI	319

SAMSUNG

MA2565 12" mono amber	75
MZ4571 14" mono paperwhite	115
ML4571 14" VGA mono 640x480	125
CVM4967 14" 1024x768, .28	305
CSD5577 15" Flat, 1024x768, .28, NI	499
CSA 7571 17", 1024x768, .31, NI	799
CSF7487 17", 1280x1024, .26, NI	1025

SEIKO

CM1450 14", 1024x768, .25, NI	529
CM2050 20", 1024x768, .31, NI	1545

SIIG

9" Mono paper white	115

SONY

1304S 14", 1024x768, .25, NI	575
1604S 17", 1024x768, .25, NI	1055
1791 17", 1024x768, .25, NI, (1604S oem)	965
1936 20", 1280x1024, .30 NI	2295

14 MOTHERBOARDS

286-16	$95
386-33/386-40 (w/ 64K cache w/o CPU)	125/129
upgrade tp 256K cache	50
486-33 w/ 64K w/o CPU	155

AMI

Mark V 386-33 w/ 64K/256K cache	480/595
Super Voyager 486-33 64K/256K	875/995
Super Voyager 486-50 64K/256K	1285/1395
Enterprise II 486-33/50 EISA w/ 128K	1295/1595
EZ-Flex 486DX-33/50 CPU card	955/1550
AMI Diag	95

DTK

486-33 64K cache (Novell certified)	695

GENOA

Express 486-50 w/256K for Local Bus (w/o CPU) Color Bahn Multimedia VGA & Turbo	545

MICRONICS

386SX-20 Phoenix BIOS (32MB max)	185
386SX-25	235
386-33 64K cache Gemini (32MB max)	415
486-33 256K cache ISA	775
486-33 256K cache EISA E2	1125
486-50 256K cache ISA	1195
486-50 256K cache EISA	1495
486-33 Local Bus w/256K cache	995
486-50 Local Bus w/256K cache	1195
486-66 Local Bus w/256K cache	1475

MICRONICS ACCESSORIES

4MB Piggy Back (up to 8MB)	399
16MB Memory Card	150
upgrade to 256K cache for old 486-33	80

NICE

486-33 64K/256K cache (w/o CPU)	215/255
486-50 256K cache (w/o CPU)	305
486-50 256K cache EISA (w/o CPU)	555
upgrade to 256K cache	60

ORCHID

486-33 256K cache, AMI BIOS (w/o CPU)	365
486-50 256K cache ISA (w/o CPU)	395
Superboard 486/VLB (VESA Local Bus for VGA & controller)	
DX-33 / DX2-66	call
DX-50	call
upgrade to 256K cache for 486-33	80

QUICK-PATH

486-50 w/64K cache, 15ns ISA (w/o CPU)	345
486-50 w/256K cache, 15ns EISA (w/o CPU)	585
upgrade to 256K cache for 486-50 ISA	80

UMC 286-12	79

15 MOUSE

AERO

IMPC-60 3 button mouse	18
IMPC-40 trackball	29

APPOINT

MousePen Pro for PC / Portable / Mac	59
Thumbelina for PC / Portable / Mac.	59

GENIUS

CLIX 3-button	19
GM-F302 mouse (3 button, PS/2 compat)	42

KENSINGTON

Expert mouse serial trackball /Bus	99/115

LOGITECH

Cordless Mouse	89
Dexxa Serial Mouse	27
First Mouse Serial	37
Fotoman Digital Camera for PC & PS/2	495
Mouseman Bus	64
Mouseman Serial PS/2 combo	65
Mouseman Serial PS/2 combo/ 5 pack	57/275
Mouseman Serial w/ WIN 3.1	115
Scanman 32	139
Scanman 32 with OCR software	185
Scanman 256	249
Scanman 256 with OCR software	299
Trackman Portable	99
Trackman Combo	79

MICROSOFT

Ball Point Mouse (portable)	119
Bus Mouse 400PPI	85
Bus Mouse (400PPI) w/ Windows 3.1	149
Serial Mouse 400PPI	65
Serial Mouse 400PPI w/ PS/2 port	85
Serial Mouse (400PPI) w/ Windows 3.1	149

MOUSE SYSTEMS

Omni Mouse (2 button)	25
Optical Mouse Pad	22
PC Mouse III Serial (optical)	69
PC Trackball II	55
Serial Bus Card (8 IRQ)	30
The White Mouse w/ Power Panel	56

16 NETWORK

Hayes LANstep	329
MainLINK II 3270 Emulation IBM & IRMA	399
MAILMAN 2.0	call

3COM

3C503 8 bit coax ethernet / 5 pack	169/799
3C503-TP 8 bit TP ethernet / 5 packs	199/950
3C503-16 coax / 3C503-16-TP Etherlink II	169
3C507 16 bit coax ethernet / 5 packs	279/1250
3C507-TP 16 bit TP ethernet / 5 packs	299/1450
3C509 coax /TP/ 5 pack Etherlink III	135/135/625
3C523B Etherlink/MC for PS/2 / 5 packs	289/1210
3C523B-TP TP for PS/2 / 5 packs	319/1435

ARTISOFT (Lantastic)

AE-2 Ethernet starter kit,10Mbps v4.1/win	459/485
AE-2 Ethernet adapter	199
AE-2 MCA Ethernet adapter	275
AE-3 Ethernet starter kit,10Mbps v4.1/win	535/565
AE-3 Ethernet adapter	235
10BaseT starter kit v4.1	595
2Mbps starter kit v4.1	355
2Mbps adapter	145
AE-2/T 16bit 10Base-T adapter	210
AE-1/T 8bit 10Base-T adapter	135
Z (2 stations) v4.1	89
AI software (individual node) v4.1	69
Ethernet Software Kit (NOS) v4.1	79
64K RAM upgrade for AE-2, AE-3 adapter	45
Articom (LAN modem sharing software)	269
Central Station Connectivity Processor	405
Lantastic for Netware	139
Lantastic for Windows (software)	165
Lantastic for Macintosh Software kit	339
Lantastic for Macintosh Hardware & s/w kit	549
Lantastic Print Server Station Ware	69
Netware Print Server Station Ware	69
Network Eye (Remote Control Access)	129
Peer-Hub 10Base-T concentrator	270
Peer-Hub AUI interface kit	270
Remote Boot ROM for AE-2, AE-3 adapter	45
Sounding Board adapter kit	72

CASTELLE

FaxPress (Network Fax Server) Fax from within DOS or Win application, supports PCL,Postscript emultion, supports Novell, MS LAN, IBM LAN (different model)	
Novell 1 line ethernet coax	2595
Novell 2 lines Token Ring 16/4Mbps	3225
JetPress (Network Print Server) for HP II,IID,III,IIID, supports thin ethernet and 10BaseT, supports up to 32 queues on up to 8 file servers	429
LANPress (Network Print Server) connects up to 4 printers, supports up to 32 queues on up to 8 file servers	
Ethernet Thick/Thin coax (1P 3S)	489
Ethernet Thick/Thin coax (2P 2S)	625
Ethernet 10BaseT (1P 3S)	489
Ethernet 10BaseT (2S 2P)	639

CC:MAIL

cc:Mail DOS v4.0 / Windows platform	199/339
cc:Mail 10 user pack / 25 user pack	239/579

COMPULAN

Ethernet	
8 bit E100 coax	95
8 bit ET500 TP ethernet	109
16 bit E200 coax	105
16 bit E210 coax & TP, BUS mastering,	159
16 bit E300 coax dual-port shared memory	129
16 bit ET600 TP ethernet	125
16 bit E650 coax & TP,Surface Mount	149
16 bit E200/2 coax for PS/2 MCA	145
16 bit E800/2 coax for PS/2 MCA	155
32 bit E900 coax, EISA Bus	249
32 bit E950 coax & TP , EISA Bus	259
Boot Prom	25
Concentrator 8 port +1BNC +1 cascading	329
Concentrator 12 port +1BNC +1 AUI	520
Pocket adapter for coax / TP ethernet	185
Arcnet	
16 bit for XT/AT Star Topology	69
16 bit for XT/AT Bus / TP	79/79
16 bit "4-in-1" Turbo Star & Bus w/NCR 90C98A ASIC	99
Arcnet 4-port Passive Hub	19
8-port Coax Stackable Active Hub	159
Pocket adapter for Arcnet	135
Token ring	
T1000 16/4Mbps	349
T1000/2 16/4 Mbps for MCA	379
MAU 8-port Type 1 cable, DB9 shielded TP	329
MAU 8-port Type 3 cable, RJ45 unshielded TP	279

FARALLON

PN380 PhoneNet card PC for LocalTalk	203
PT100 PhoneNet talk for PC	145

GATEWAY COMMUNICATION

G/Ethernet 16 coax / 16 TP	159/179

INTEL

EtherExpress 16	135
EtherExpress 16TP	145
EtherExpress 32 EISA	553
EtherExpress ISA Hub Adapter	585
EtherExpress EISA Hub Adapter	685
NetPort II Thin/Thick Ethernet	519
NetPort II 10BaseT	529
NetPort II Token Ring	669
NetSatisfaxtion	635
TokenExpress 16/4 for ISA / EISA	535/685
TokenExpress 16/4 for MCA	535

NOVELL

8 bit NE1000 coax ethernet	115
16 bit NE2000 coax ethernet	165
16 bit NE2000TP TP ethernet	175
32 bit NE3200 coax	699
NE10T-Hub 4 Port Concentrator	235
NE10T-Hub 8 Port Concentrator	349
Netware Lite + DR DOS 6.0	69
Netware 2.2	
5 users / 10 users	489/1089
50 users / 100 isers	1925/2955
Netware 3.11	
5 users / 10 users	619/1369
20 users / 50 users	1925/2799
100 users / 250 users	3859/6885

SMC (WESTERN DIGITAL)

8 bit coax Ethercard Plus Elite	129
6 pack	715
16 bit coax Ethernet Plus Elite / 6 pack.	155/895
16 bit TP Ethercard Plus Elite 16T	169
16 bit TP Ethercard Plus Elite 6 pack	975
Ethercard Elite 16 combo (coax/10BaseT)	225
Ethercard Plus/A for PS/2	219
Netware Boot ROM	34
Concentrator 8 Port (10 Base T Ethernet)	339

XIRCOM

PE2-10B2 Pocket Adapter Ethernet coax	325
PE2-10BT Pocket Adapter Ethernet 10BaseT	345
PT2-16B3 Pocket Adapter Token Ring 16/4Mbps	615

CABLES & ACCESSORIES

10 BASE-T Twisted pair cable, 1000', PVC	95
10 BASE-T Twisted pair cable, 1000'	165
RG58, 1000'	109
Belden 8259, RG58, 1000'	165
Transceiver AUI <---> TP (coax to 10BaseT)	69

17 POWER SUPPLIES

AMERICAN POWER CONVERSION (UPS)

APC-400 Smart-UPS (286, 386 WS)	309
APC-600 Smart-UPS (386, 486 FS)	399
APC-900 Smart-UPS (386, 486, FS and WS).	639
APC-1250 Smart-UPS (multiple FS and WS).	799
APC-450 Back-UPS 286, ps/2, 386	235
APC-600 Back-UPS 286, 386 FS	299
APC-800 Back-UPS 800RT, 2-4ms, 15 mins	565
APC-750 On-Line UPS (286, 386, 486 FS)	1365
APC-1500 On-Line UPS (multiple servers)	2499
APC PowerChute for Novell / for UNIX	79
APC UPS Monitoring Board for NetWare	75
Power Doctor (for DOS) I/F kit for Smart-UPS	79

PC POWER COOLING

Standard 220 desktop/full tower	95
Silencer 270 desktop/slim/full tower	175
Turbo-Cool 300	
slim (baby & mid tower)	165
AT desktop/full tower	185
Turbo-Cool 450 desktop/full tower	345
InnerSource 2210 UPS int, 95-132 VAC, 220W DC, 100W AC, equivalent to 550 VA external UPS	355
Novell Netware Interface for InnerSource 2210 UPS	55

OTHERS

150W / 200W (XT) (UL)	40/48
230W / 250W for Baby AT & Mid Tower	55/62
230W for AT	48
230W / 300W for FullTower	59/89
550W / 1200W (UPS)	279/999

18 PRINTERS

CANON

BJ-10ex (Bubble jet)360 dpi,37K buf	299
Auto Sheet Feeder	79
Other Accesories same as BJ-20	

BJ-20 w/ Auto Sheet Feeder	395
Bag / Battery	39/45
Print Head Cartridge	22
CITIZEN	
GSX 200 (9 pin)	165
GSX 130	205
GSX 140 Plus (24 pin)	269
Color Option for above printers	45
Auto Sheet Feeder for GSX 140	109
GSX 145 (24 pin, 132 column)	355
Color option for GSX 145	65
GSX 230 Scalable Fonts & quiet	259
GSX 240 Scalable Fonts & quiet	329
PN48 notebook printer, 1ppm, 2lb, battery, case	325
FUJITSU	
DL1100 mono	275
HEWLETT PACKARD (LaserJet w/ toner)	
Desk Jet 500	395
Desk Jet 500C	589
Jet Ram Memory 256K for 500 & 500C	69
Laser Jet IIP+	775
Laser Jet III	1445
Laser Jet IIIP / IIID / IIISi	995/2395/3495
Accessories:	
Envelope Tray(15 envelopes) for III	69
Envelope Tray for IIP, IIIP	79
Envelope Feeder for IIID	295
HP Postscript Cart. for IIP, IIP+, III, IIID	395
Legal Tray for HP II, III	69
Lower Cassette (w/ letter tray) IIP, IIIP	149
Toner for HP II, III	79
Toner for HP IIP, IIP+, IIIP	66
Jet Ram Memory for HP II	
2MB / 4MB	135/205
Jet Ram Memory for HP IIP, IIP+, III, IIIP, IIID	
1MB / 2MB	75/115
3MB / 4MB	155/195
MICROTEK	
Scan Maker 600Z	1295
TrueLaser 6ppm, 2MB, 35 fonts	1355
PACIFIC DATA PRODUCTS	
ProTracer inkjet printer/plotter, A- to C-size output, 360dpi, i960RISC processor, 512K, 45dBA	1075
5 MB memory upgrade	439
8 MB memory upgrade	669
postscript emulation card	375
HP-GL Emulation Card	325
sheet feeder I / II	115/105
ink cartridges	19.50
PANASONIC	
1180i / 1123	158/199
1124i / 1624	285/349
Auto sheet feeder for 1124 only KX-P36	120
2123 24 pin, 43.5dBA, color capability	239
2124i 24 pin, 43.5dBA, color capability	319
2180 9 pin, 45dBA, color capability	159
Color upgrade kit KX-PCK11	49
Single bin cut sheet feeder KX-PT10	95
2624 (24 pin, quiet printer 46.5 dBA)	375
32K Buffer dot matrix printers KX-P43	65
Serial interface card KX-P19	75
4410 Laser, 512K 5ppm	625
1MB mother Ram board KX-P444	115
1MB daughter Ram board KX-P445	99
LaserBoard 1MB (3rd party)	105
Corona KX-PCR3	45
Developer KX-PDP4	105
Drum KX-PDM4	89
Extra Cassette KX-PKC2	45
Fonts Card KX-P47x	95
Fuser Unit KX-PFS5	105
Optional Second Cassette KX-P495	135
Toner KX-P453	35
4430 Laser, 1 MB, 5ppm	885
Accessories same as 4410	
4420 Accessories	
RamBoard 1MB / 2MB / 4MB	99/139/219
Developer KX-PDP2	95
Drum KX-PDM2	99
Envelope Tray KX-P431	59
Fonts Card	95
Legal Tray KX-P425	45
Ozone Filter KX-PFT2	26
Toner KX-P451	39
4450 Accessories	
RamBoard 1MB	139
others same as 4450i	
4450i Laser, 11ppm	1095
RamBoard 1MB / 2MB / 4MB	99/139/219
Developer KX-PDP1	95
Drum KX-PDM1	145
Envelope Tray KX-P430	59
Fonts Card	95
Legal Tray KX-P420	45
Ozone Filter KX-PFT1	29
Toner KX-P450	35
4455 (Postscript) 11ppm	1715
RamBoard 2 MB	159
others same as 4450i	
QMS (Adobe Postscript)	
QMS-PS 410 4ppm, 2MB, 45 Fonts	1375
1MB / 2MB / 4MB Memory	125/165/245
Envelope / Legal / Letter Tray	69/69/69
Lower Cassette with Letter Tray	160
Toner	95
SEIKO	
Smart Label Printer Plus (IBM/APPLE)	159
Box of Label (2 rolls per box)	10.95
TEXAS INSTRUMENTS	
MicroLaser Plus PS17 / PS35 9ppm	1155/1455
Apple Talk Kit / Ram Board 1MB	99/69

LASER PRINTER ACC.

COMPUTER PERIPHERAL	
Jet Page (for HP II)	295
GENESIS	
JetTray 250E, holds 250 #10 envelopes	469
IQ ENGINEERING	
Super Type Master Library	99
Super Cart. 2 for HP II, IID, IIP, IIP+, III, IIID	249
Super Cartridge 2 & 2LC	269
Super Cart. 3 Pro+ for HP III, IIID, IIIP, IIISi	249
Super Cart. 3 Creative Collection for III family	249
Desk Jet 500 Professional	99
Desk Jet Plus Professional	99
LASER MASTER	
WinJet 800 800dpi, Postscript adapter for HP II, IID, III, IIID	699
PACIFIC DATA	
25 in One! III (for Deskjet 500)	99
25 in One! III (for HP II, IID, IIP, IIP+, III, Microtek)	245
Complete Font Library for HP III, IIID, IIIP	255
Font Bank (NEW) (for all HP Laserjet) stores soft fonts, 0.75MB / 1.5MB	205/269
Headlines Cartridge for HP II, IID, IIP	185
MacPage Driver and Connection Kit for Mac & HP II, IID, IIP, IIP+, III, IIIP	95
Paicfic Connect (for HP II, IID, IIP, IIP+, III, IIID, IIIP) connect up to 5 PC and/or Mac to a printer 256K/1.25MB	265/299
Pacific Page & 2MB (Postscript for HP II)	389
Pacific Page II / XL(postcript for HP II)	719
Pacific Page P.E. (for HP IID, IIP, IIP+, III, IIID, IIIP)	269
Pacific Page P.E. & 2MB	405
Pacific Talk	179
Pacific Page XL (for HP IIP, IIP+, III, IIID, IIIP) Postscript emulation cartridge comes with 2MB & accelerator board 8 times faster than other cartridges	649
Pacific Print for network & HP II, IID, IIP, IIP+, III, IIID, IIIP	99
Plotter in a Cartridge (for HP II)	225
Plotter in a Cartridge P.E. for HP IID, IIP, IIP+, III, IIID, IIIP	225
1-2-4 Plus (for HP II, IID) 1MB/2MB/4MB	115/155/235
Pacific 4 Memory (for HP IIP, IIP+, III, IIID, IIIP) 1MB/2MB/4MB	95/135/215
Pacific Si Memory (for HP IIISi) 1MB / 4MB	85/215
LP Memory (for IBM 4029E) 1MB/2MB/3.5MB	129/179/249
Pacific T Memory (for Epson 6000) 2MB / 4MB	209/299
PELICAN All type ribbons	visit us

19 SCANNER

TAMARACK ArtiScan Flatbed Scanner 24 bit color, 256 gray levels, comes with Picture Publisher LE 3.0 and Recognita plus OCR or PhotoStyler Full 1.1 only, SCSI interface

TTI 6000C 600dpi	1195
TTI 8000C 800dpi	1495
Slide Scan Kit (transparency, slide, X-ray)	695
MICROTEK Scan Maker 600Z	1295
Hand scanners... see Logitech in section #17	
E-TECH	
4256G 256 gray scale (w/OCR)	...145(169)
4200C 256/4096 color (w/OCR)	295(319)

20 TAPE BACKUP

COLORADO	
DJ-10 (120MB) QIC-40 w/ cable	$189
DJ-20 (250MB) QIC-80 w/ cable	255
AB-11 External tape port	45
Cable (2 Floppies & tape back up)	9
FC-10 Controller	95
KE-09 Ext kit w/o controller	75
TC-15 controller w/ data compression	195
Unix/Xenix driver for DJ-10, 20	129
QFA-700 (700MB)	725
TC-02 adapter (required)	259
Trakker 250MB ext. (printer port)	475
Trakker 120MB ext. (printer port)	395
EVEREX	
EV-811 8 bit adapter QIC-02 for XT, AT	105
EV-880 floppy tape adapter for AT	65
MICRO SOLUTIONS (External)	
120MB / 250MB External (printer port)	365/425
MOUNTAIN NETWORK SOLUTIONS	
FS1200 1.3GB, 4mm, SCSI cont, int/ext	3595/3905
FS2100 2.2GB, 8mm, w/ SCSI cont, ext	4895
FS7250 150-250MB, QIC-02, w/ cont, ext	1435
FS7250 250MB, w/ SCSI cont, ext	1565
SUMMIT	
SE120 120MB w/ Central Point Back up	195
SE250 250MB w/ Central Point Back up	265
SE305 350MB Backup	369
Accelerator board for SE120 & SE250	165
SYSGEN	
250 MB External (printer port)	399
CASSETTES	
3M, VERBATIM	call

21 VGA CARDS

Desktop TV	319
Hauppauge Win/TV (New)	465
Prolab Video Master	185
Video Blaster	349
All cards 1024x768 except as stated	
CGA / MGP card (Monographic w/ Printer)	$29
ET4000 Tseng Lab 1MB	99
Oak067 Super VGA 512K	52
Oak077 Super VGA 1MB	69
SVGA 256K	55
AMI	
FastView EISA VGA Graphics w/ 1MB	549
ATI	
VGA Stero 512K w/ speakers	239
Wonder XL OEM w/ 1MB	115
Wonder XL series w/ mouse, 1MB, Hi-color	169
Graphics Ultra 1MB (VRAM) w/ mouse	325
Graphics Vantage 1MB(DRAM) w/mouse	255
DIAMOND	
SpeedStar 24X w/ 1MB 16 million colors	179
Speedstar 24 bits w/ 1MB 16 million colors	159
Stealth 1MB, VRAM, w/Sierra Hi-color	225
EVEREX	
Viewpoint NI 256K/512K	129/149
GENOA	
7900 1MB, 16 million color, 24 bit	159
8860 1MB 1280x1024 Hi-color	239
M2100 VGA2TV	425
MYLEX	
GLE911 EISA, 1280x1024, 1MB	409
GXE020B 1280x1024, 4MB DRAM 2MB VRAM, TMS34020, Tiga/EISA	1039
NUMBER NINE (TI34020)	
GXI Lite Level 21 1024x768 16 colors at 72 Hz	call
GXI Level 23 for CAD/Win 1280x1024 16 colors at 72Hz, 1MB VRAM 1MB DRAM	1209
GXI Level 24 for Windows 1280x1024 256 colors at 72Hz, 2MB VRAM	1279
GXI Level 25 for CAD/Win 1280x1024 256 colors at 72Hz, 2MB vram 1MB dram	1429
GXI Level 29, 24 bit 1280x1024 65536 colors at 72 Hz 4MB vram 1MB dram	1719
ORCHID	
Fahrenheit VA/ VLB, windows accelerator w/voice annotation, VESA Local bus, 1MB, 24 bit	call
Fahrenheit 1280-D 1MB with Hi-color	225
Fahrenheit 1280 w/ Accelerator 24 bit	225
ProDesigner IIs 1MB with Hi-color	139
ProDesigner IIs-D 1MB with Hi-color	189
ProDesigner IIs, 1MB, Hi-color for MCA	379
UNITED SOLUTIONS	
Utra 1MB 1280x1024 Hi-color	139

III SOFTWARE

ADOBE	
Illustrator 4.0 for Windows	359
Plus Pack for Mac / Windows	119
Postscript Cartridge for HP II	239
Type Cartridge 1: Display Faces	99
Type Cartridge 2: Best Sellers	99
Streamline for Windows	125
Type Align for Windows	63
Type Manager for Windows	59
Type Set 1/2/3 for Windows	65/65/129
Type Set: Overheads & Slides	87
Type Set: Spreadsheets & Graphs	87
AUTODESK	
AutoSketch for windows / DOS	179/149
Generic CADD 6.0	299
Multimedia Explorer	120
BORLAND	
C++ Professional 3.1 for Windows	325
C++ 3.1 for Win & Application Frameworks	485
dBase IV 1.5 (special)	439
ObjectVision 2.1	102
Paradox 4.0 / upgrade	499/185
Quattro Pro WINDOS / upgrade	299/139
Quattro Pro 4.0/ upgrade	235/85
Buddle of Quattro Pro3.0 + upgrade	199
Screenery (Windows wallpaper, screen saver)	25
Turbo C++ for Dos / Windows	69/105
Turbo Debugger & Tools 2.0	99
Turbo Pascal for Windows / Dos	119
IBM	
OS/2 2.0 / Upgrade	145/99
MICROSOFT	
C/C++ 7.0 w/ SDK (Upgrade)	315(135)
DOS 3.3 / 4.01	59/19
DOS 5.0	55/65
Entertainment Pack for Windows I / II / III	28
Excel 4.0 for Windows / Upgrade	299/97
Excel 4.0 for Win Competitive Upgrade	125
Flight Simulator	39
Joystick : Warrior 5	14.50
Maxx II Control Yoke for PC	49
Maxx Pedals for PC	39
Lan Manager v.2.1, 1 - 10 user	1299
every additional 10 users	659
unlimited pack(must purchase 1-10 usr)	3599
Mail Remote Workstation	125
Money for Windows	49
Multimedia Development Kit	299
Office for Win(Excel, Word, Power Point, Mail)	4
PC Mail Server for DOS & Windows	4
Power Point for Windows/upgrade	299/
Project 3.0 for Windows/upgrade	419/1
Publisher for Windows	1
Quick Basic Compiler 4.5	6
Quick C for DOS / Windows	69/1
Quick C Compiler w/ Quick Assembler	1
Software Development Kit (SDK)	3
Test for Windows	2
Visual Basic for Windows	1
Visual Basic Pro Tool Kit	1
Windows 3.1/ up grade	65/
Windows 3.1 Device Driver Development Kit	3
Word for DOS / Windows	207/2
Word for Windows upgrade to v2.0	1
Works for Windows	1
SANTA CRUZ OPERATIONS (SCO)	
SCO C++	91
SCO ODT Personal System 2.0 / tape	1170/10
SCO Multiview 386 1.6.1	2
SCO XENIX-NET 386 single server v1.3.0	6
UNIX 386 Dev Sys 3.2.2 C-Compiler & Dev Tools	8
UNIX 386 GT Oper Sys 3.2.2 Multiuser	8
UNIX Operating System 3.2.4	8
XENIX 386 Dev Sys 2.3.1 C-Compiler & Dev Tools	61
XENIX 386 GT Oper Sys 2.3.4	58
VENTURA SOFTWARE	
Ventura Publisher Gold 4.0 for win	48
Ventura Publisher 3.0 w/ up grade	46
Ventura Publisher 4.0 Education specia	
DOS / Windows / Mac	1
WORDPERFECT	
DataPerfect / DrawPerfect	26
Figure Library (Bus/Edu/Fig/Holiday/Leisure)	7
LetterPerfect / PlanPerfect	115/23
WordPerfect 5.1 for DOS / Windows	249/25
WordPerfect Trade up (from DOS to Win)	7
WordPerfect upgrade for DOS	7
WordPerfect Executive/Office/Works	145/95/16
OTHERS	
3-D Charts to go	5
After Dark for Windows (screen saver)	2
Aldus Freehand 3.0 for Windows	37
PageMaker 4.0 for Windows	46
Persuasion 2.1 for Windows	32
Photostyler 1.1 for Windows	49
Automap (road atlas)	5
CALERA Wordscan 1.1/ plus	182/42
Carbon Copy Plus 6.0 / for Win	119/11
Central Point Anti-virus / Backup 7.1 oem	45/1
PC Tools 7.1 / with Anti Virus	99/10
Check-It	8
Clipper 5.01	47
Corel Draw 3.0/ upgrade	365/14
Definition Plus! (American Heritage Dict.)	5
Direct Access 5.1	6
DR DOS 6.0	4
FaceLift for WordPerfect	6
Fastback Plus 3.1/for Win	117/11
Fax Grabbler w/ Norton Desktop for Win	9
Fox Pro 2.0 / 6 pack	459/54
Geoworks Pro	12
Grammatik V for DOS / Windows	5
Hardvard Graphics for Win (oem)	375(32
Hardvard Graphics 3.0 for DOS (oem)	399(34
Hollywood for Window	30
LapLink Pro v4	10
Lotus 1-2-3 for Windows (special)	32
1-2-3 Rel 3.1+ for DOS	38
1-2-3 for UNIX 1.1 single	49
Ami Pro for Windows	26
MacPrint	8
Master Piece True Type Library	6
MicroGrafx Designer 3.1	35
More Fonts / Display Faces	77/7
Norton Anti-Virus 2.1 / Backup 1.2	8
Desktop 2.0 for Windows	10
Utilities 6.01	11
PC Anywhere 4.5 Remote and Host	11
PFS: First Choice (w/ Prodigy start-up kit)	7
Pacioli 2000	2
Pro-scan (virus identifier & remover)	4
Procomm Plus 2.1/win	69/8
Q & A (Symantec)	23
QA Plus	8
Quarterdeck	
DesqView 286 /DesqView 386 v2.4	79/12
DesqView / X	16
Qemm 386 v6.0	6
Manifest / Qram	39/4
Quicken for DOS 6.0 / Mac/ Windows	4
QuickBook / QuickPay (payroll)	87/3
QuickBook & QuickPay	11
Right Writer 5.0	5
Speedstor 6.5	6
Speedstor Plus w/ SCSI controller	7
SpinRite II	6
Stacker Data Compression 2.0	8
Stacker AT/16	17
Superstor 2 / plus	69/7
The Far Side (computer calendar)	4
Time Slip v.5.0	18
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Wave for Window	7
Winfax Pro	7
XTree Gold 2.5 / for win	89/4
Educational / games	on sale no
Microsoft Press Books	$5/$

CREATIVE TOOLS

Graphic Databases For The CD-ROM Era

Keeping Track Of Images

BY TONY REVEAUX

RESOURCES:

***Canned Art: Clip Art for the Macintosh*, $29.95**
Peachpit Press
2414 Sixth St.
Berkeley, CA 94710
1-800-283-9444

Search, $199
Multi-Ad Services, Inc.
1720 Detweiller Dr.
Peoria, IL 61615-1695
(309)692-1530

Mariah, $149
Symmetry Software Corp.
8603 Royal Palm Rd., Ste. 110
Scottsdale, AZ 85258
(602)998-9106

PICTure This 2.0, $149
FGM Inc.
131 Elden St., Ste. 308
Herndon, VA 22070
(703)478-7428

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When you buy a package of clip art on floppies, there is usually a printed catalog of the images, and each disk has a certain category on it. But CD-ROMs have so much material, it could take a phone-book-size catalog for all the images.

Dubl-Click Software's "The Wet Set" contains the entire collection of their WetPaint bit-mapped clip art. SunShine's "Visual Delights" has—on one disc—fifty-eight hundred images, many of them wonderfully complex and detailed designs from Victorian times through the twenties. How do you deal with all this largesse?

VISUALIZE PIX

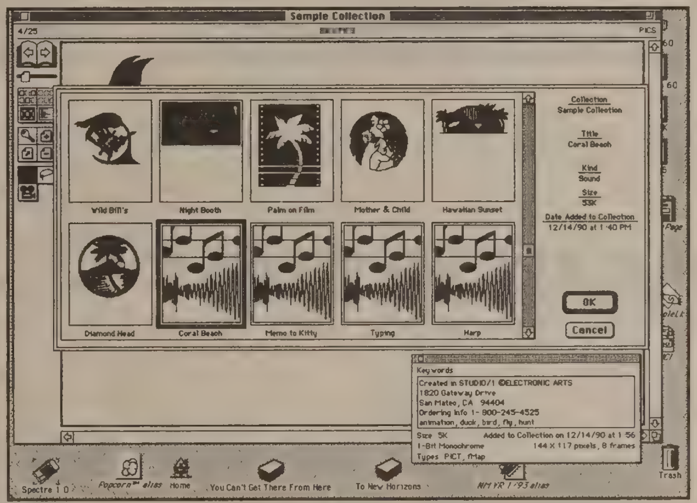
The bible of Mac electronic clip art is the second edition of *Canned Art: Clip Art for the Macintosh,* by Erfert Fenton and Christine Morrissett. This is a 640-page compendium of printouts from commercially available digital clip art, from more than thirty-seven vendors. Images are arranged by vendor and software edition, with background notes, and ordering and pricing information. The book includes a keyword index and covers formats, file management techniques, and utility software. A two-disk sampler of clips from the volume is available for $10 from the publisher. Many of the graphics are compatible for IBM-PCs as well. In the first edition, the authors were able to include printouts of most of the images of each company. Since then, there has been so much expansion, the second edition has just samples from each vendor.

Before CD publishers had to keep track of images for end-users, they had to organize them in-house for their own use. They had to keep track of all of their files, so they adopted off-the-shelf graphic databases or developed their own. Now, most of the clip art CD-ROMs come in a precatalogued format, and include a run-time version of the file management application. SunShine and Pro Art have Multi-Ad SEARCH, and Dubl-Click has—in the same disc—sets in Paint, Mariah, and the old Picture Base formats. They all use the Macintosh hierarchical file format in distributing the data on the disc, under categories such as Fantasy, Landscapes, and People.

Mariah has a "slide show" function that browses through folders displaying one image at a time—but can you imagine going through fifty-eight hundred frames to find what you want? You can search by keyword, such as "camera," "sun," or "sword", and quickly see if there are any images that correspond to your needs. You will have to buy the application to create your own database for your own realms of images, sound, and animations, but these CDs give you the chance to sample them.

MULTI-AD SEARCH

Multi-Ad Search is based upon the Catalog database interface module. You can create as many Catalogs as you want, perhaps one for each project. A single Search query locates an art file from a database containing up to thirty-two thousand separate images whether the art is located on a floppy, a CD, hard drive, removable cartridge, optical cartridge, or mountable tape. This includes files located on servers and concurrent multiuser, up to 128 users. The query response is application independent, but is limited to EPSF, PICT, MacPaint (PNTG), RIFF, or TIFF file formats.



Collection
Sample Collection
Title
Coral Beach
Kind
Sound
Size
53K
Date Added to Collection
12/14/90 at 1:40 PM

Keywords
Created in STUDIO/1 ©ELECTRONIC ARTS
1820 Gateway Drive
San Mateo, CA 94404
Ordering Info 1-800-245-4525
animation, duck, bird, fly, hunt
Size 5K Added to Collection on 12/14/90 at 1:56
1-Bit Monochrome 144 X 117 pixels, 8 frames
Types PICT, fMap

Mariah can catalog and play SND sound files and PICS animation files as well as different graphics formats.

Once you've located the image, you can manipulate it by previewing, printing and copying. The strength that elevates Search above most other graphic databases is its range of search criteria, which can be used in any combination: keywords, filename, file type, volume, and expiration date. You can also create new definitions, e.g. for jobs or sources that can be used for searching. Once a thumbnail image is added, it can be previewed and viewed in enlarged or reduced sizes, though not in the resolution of the original.

Search is able to place images directly into QuarkXpress and Multi-Ad Creator 2.5. But the main weakness of Search is that you can't preview the images in their native locations before selecting them by name in the GetFile dialog box. Mariah is much better for browsing.

MARIAH

Mariah is a full-featured graphic database. It's simpler to use than Search, but it too can support up to thirty-two thousand images in multiple file formats. Mariah is well suited for multimedia applications, since it can support sound and animation files, and incorporates the option of playing SND sound files and PICS animation files

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from within the view windows. The Record%A%Page option brings up a Macintosh system recording panel, which allows you to record sounds directly into Mariah as SND files, if you have a Mac LC, SI, or Performa, or if you have Macromedia's MacRecorder.

If you are using PICS animation files in programs like MacroMind Director and Magic, Mariah can be very useful. But even the latest version of Mariah does not support QuickTime. According to Symmetry, they are working on adding QuickTime compatibility in "the near future."

Unlike Search, Mariah has a Slide Show function which will automatically display one image after another, read from outside files as well as from within its own Collections. The reason for this reflects the main difference between the two database programs: Search is a good flat file database with Boolean search functions, and it maintains speed and efficiency by storing the graphics only as thumbnail reference files. Mariah adds a copy of each file to a Collection. Thus, if you carry a Search Catalog file outside to another machine, it can tell you the names of the files you want, but you'll have to go back to the host system to get them. A Mariah Collection file is more portable—it carries the graphics, sound, and animation files with it. It may not always fit on a floppy, but it will be complete. Search is better suited to client-server and network environments for multiuser workgroups.

A Mariah Collection file is more portable—it carries the graphics, sound, and animation files with it.

PICTURE THIS 2.0

What do you do when the image you need is not only in another format, but resides in a totally different machine system environment? PICTure This is a graphics file conversion utility that translates many other kinds of files to the Macintosh PICT format. It is especially handy to bring in EPS clip art to non-PostScript programs such as DeskPaint or MacPaint. However, for both Mac EPSF and PC EPS, the resulting PICT will be only the bitmap screen display, which tends to be a very small image that breaks apart immediately as you enlarge even one step. As PICT files, these different format translations can be scaled and manipulated within some Mac graphics programs, but they are used mostly to be included as is in presentations and document preparation. By itself, PICTure This does not support printing.

Forgive the laundry list, but it indicates how PICTure This can make it easy to acquire graphic files: Lotus BIT/RLE, Lotus PIC, OS/2 BMP, Windows BMP, GGM, Dr. Halo CUT, Macintosh EPSF, PC EPS, CompuServe GIF, Apollo GPR, Amiga IFF/ILBM, GEM IMG, Visilog IMG, MacPaint, ZSoft PCX, Photoshop, PCPaint PIC, PixelPaint, Silicon Graphics RGB, Letraset RIFF, RIX, Sun Raster, Targa, TIFF, X11 Bitmap, X11 XWD. The program's tutorial includes a folder of "alien" files, such as XWD, SUN, TGA, and PCX. Of course, Mac access to these other formats is achieved by means such as disk media, direct serial cable transfer, or by network and modem.

PICTure This supports the Open Application and Open Document Apple Core Events, where it attempts to determine the format of the target file and invoke the corresponding translator. If the document is a picture file (PICT), PICTure This will attempt to display the picture with its built-in picture viewing utility. The Auto-Sense File Format examines the selected file and displays it in the Format box. If the target file is a folder, PICTure This will examine each file within the folder and try to translate it. PICTure This supports 32-bit addressing and can use virtual memory.

The Macintosh PICT is a QuickDraw Picture Format. Its resolution is output device independent, and will print at the optimal resolution of the printer. The PICT image type is vector and bitmap, a binary page description language. Because it is a language, not a format, PICT has few structuring requirements. This enables it to be a very flexible translator, but you cannot expect the saved translated file to always match the color depth or resolution of the original target file within its host environment. PICT 1 and PICT 2B&W are black and white files, while PICT 2 Color is a color file. In the Translations Options dialog box, you can choose among the three for memory buffer usage size, picture version, resolution, dithering method, and to swap black and white.

PICTure This is a one-way converter, but FGM includes some rough-and-ready "as is" PICT2 utilities that convert Macintosh PICT files to Sun Raster files, various Targa formats, X Windows XWD files, and ZSoft PCX files (sixteen or 256 colors). Transverter is a file translator utility which "transverts" EPS files on the Mac to Paint, PICT, and Draw, and EPS on the IBM-PC to CGM, WPG, PCX, TIF, GIF, or EMF ($49.95; Studio Art, P.O. Box 4258, Las Vegas, NV 89116, fax 702/641-7001).

PICTure This is one of those software tools whose progress always seems to leapfrog their documentation. If you find mysteries and inconsistencies, you will get good help at 1-800-783-7428 or AppleLink D1253.■

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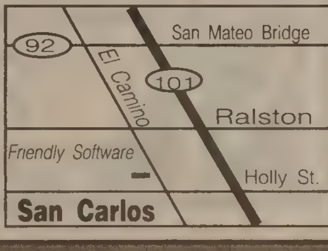

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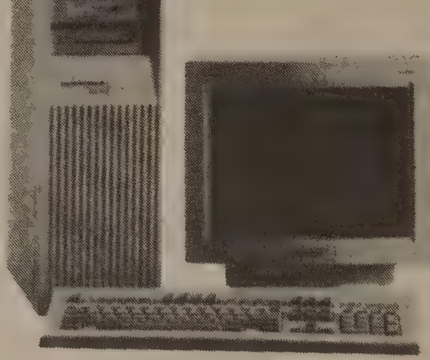

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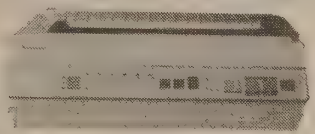

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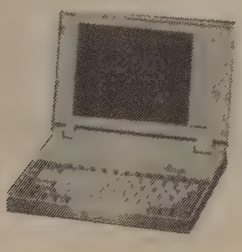

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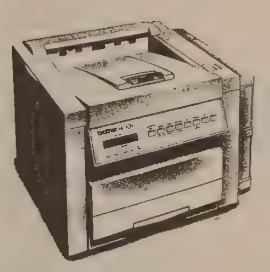

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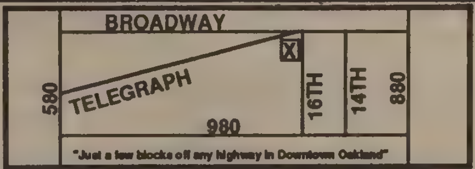

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MacRenderMan—A World Unfolds

Tools For Creating And Manipulating Images

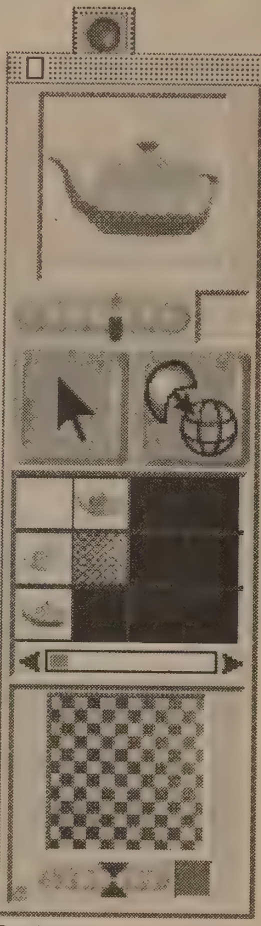
BY MATTHEW LEEDS

A little less than ten years ago I got my first computer. Those first few months I spent just about every waking hour working with that machine, learning how it worked, feeling as if a new world had opened up for me—as indeed it had. I ended up changing my profession, learning a new set of skills, just so that I could spend more time working with that wonderful new contraption. Pixar's MacRenderMan creates that same sort of feeling.

There are many ways to define RenderMan. It's a programming language which specifies a comprehensive way to describe objects, scenes, lights, and cameras, so that photorealistic images can be created from them. It's a collection of procedures to transfer the description of a scene to a rendering program. It's a rendering program that turns RenderMan Interface Bytestream (RIB) files into picture files. RIB files are to images what PostScript files are to the printed page.

Just as you probably don't write your own PostScript files directly (you use a word processor or DTP program to model your pages onscreen before you send the file to be rendered, or printed, by a printer that contains a PostScript rendering engine) you don't write RenderMan files directly. You use a modeling program to create and/or compose objects and their surface characteristics, lights and their characteristics, and a point of view—also known as a camera. The modeling program then either sends its data directly to a rendering program, or writes a RIB file that can be rendered later.

What's remarkable about RenderMan is that it can describe a scene in such detail that it cannot be distinguished from a photograph. While most rendering work is not quite to that level of detail, the results of RenderMan-based work are used every day. Cosmair, Inc. a cosmetics company (L'Oreal, Lancôme) uses ShowPlace and MacRenderMan to create photorealistic prototypes of their product packages. RenderMan technology was used in *Terminator 2, Beauty and the Beast,* and *The Abyss.*



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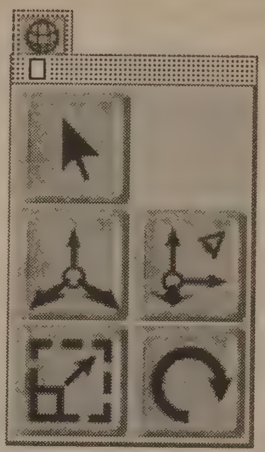

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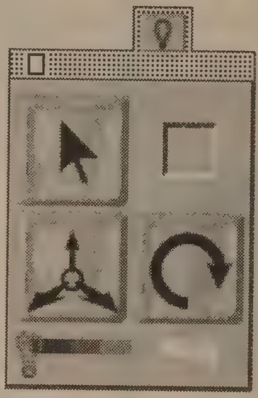

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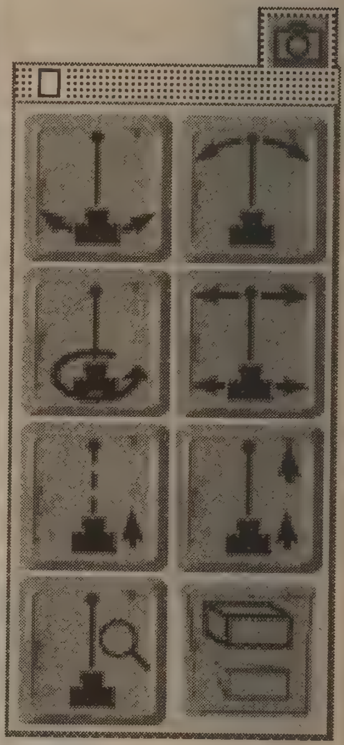

Cameras

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SHOWPLACE

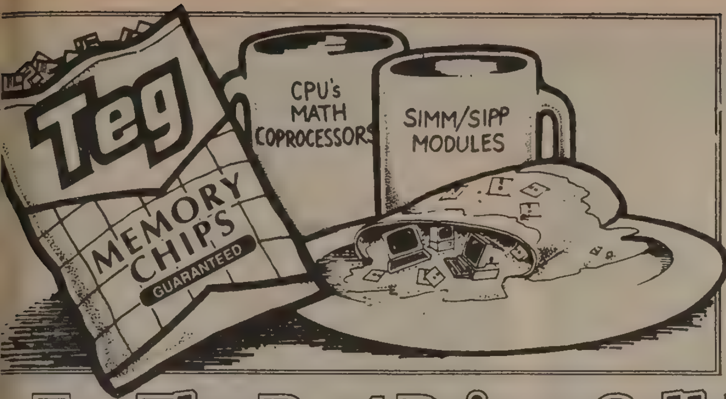
Perhaps the simplest approach to RenderMan is through ShowPlace, Pixar's program for arranging objects, lights, and cameras and rendering the results via RenderMan. While ShowPlace does not include a modeler (you can't create your own objects) it does come with an extensive collection of objects. There are also many third-party collections of object files (and other good stuff) available.

ShowPlace uses four separate toolboxes: the Object toolbox is used to select, move, resize, and rotate objects; the Surfaces toolbox is used to select surfaces, apply looks (see below), and set attributes of looks; the Lights toolbox is used to select, move, and rotate lights, set light intensity and color, and set light type; and the Camera toolbox, where you set a camera's position. While it's not quite as simple as it sounds, it's not all that difficult either.

Each object is a collection of one or more surfaces. Each surface can have its own appearance, or Look. Looks are ShowPlace's way of dealing with RenderMan shaders, which describe what objects should look like and how lights and the atmosphere should behave in a scene. Looks form a user interface for controlling shaders; they can be considered a superset of a shader that includes additional data, such as a text description of the shader, help information, and rendered examples of the shader's effects. ShowPlace includes a set of Looks including wood, marble, metal, and building materials.

Shaders and Looks are procedural descriptions rather than bitmaps. As such, they can include parameters that alter the geometry of an object. This could include the rough surface of a stucco wall, the pebbly gravel walk, or the ridged surface of an industrial steel floor. These geometric displacements can cast their own shadows or create their own reflections.

ShowPlace includes a program called the Librarian that handles the installation of



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Looks and Objects. It also includes LabelMaker, which can create new surfaces from PICT files or text. This lets you wrap an object with a PICT file, or apply text as a surface to an object. You can also import RIB files created by other applications and manipulate them in ShowPlace.

ShowPlace lets you control the format of the rendered image, both in the file size and color depth. It can also save an alpha channel mask that separates objects from their background. This can be imported into Photoshop for compositing with other images.

ShowPlace and MacRenderMan are bundled together. MacRenderMan includes PhotoRealistic RenderMan for rendering, RenderMonitor for background rendering, RenderApp for viewing images and managing the display and conversion of images, and ShaderApp for creating new shaders. It also includes a sample library of RIB files, shaders, and texture maps. A video training tape for ShowPlace is also included. This package has a list price of $695.

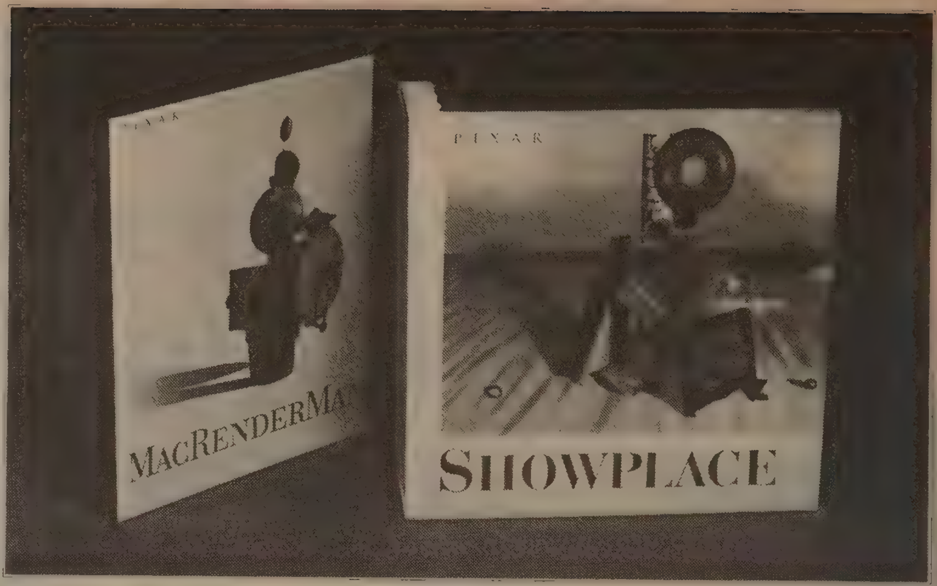
A CD-ROM version of this bundle is also available. It includes sneak previews of Pixar's Classic Textures, a collection of photographic textures, and sample images and excerpts from Pixar's award-winning animated films. No printed manuals are included in this package, but online documentation is provided and may be printed out. The training tape is not included in this package. List price is $495.

THIRD PARTY ENHANCEMENTS

If you want to create your own objects, SwivelMan, MacroMedia's bundle of Swivel 3D Professional 2.0 and MacRenderMan, may be just the thing for you. Swivel 3D is reasonably easy to use, and has its own large library of objects to work with as a start. It also includes Shader Presets, which allow quick and easy access to RenderMan shaders. Swivel 3D can export RIB files for rendering with MacRenderMan, or for import into ShowPlace.

In addition to Swivel 3D, Alias Research has just announced a new version of Sketch! that offers RIB file export. Sketch! excels at creating smooth curved surfaces through its use of NURBS modeling. Non Uniform Rational B-Splines provide a more accurate way of modeling curves than polygon-based definitions. NURBS-based models, when exported to a RIB file, are no longer unique, but NURBS-based modelers are becoming more popular despite their slower speeds.

Other modelers that output RIB files include Abvent's Zoom and Focus, Aldus's Super 3D, ASG's ModelVision, AT&T's MacTopas, Dynaware's DynaPerspective,



Macromedia's MacroMedia 3D, VIDI's Presenter Professional and ModelerPro.

The Valis Group offers a collection of shaders, looks, and object files. For example, Volume 1 includes seventeen shaders that include a range of adjustable parameters for changing the characteristics of each surface. These shaders include anodized aluminum, transparent bumpy glass, tortoise shell, stained wood veneer, tweed fabric, and others. Volume 2 contains a set of a dozen shaders or looks, including sprayed acoustic ceiling, diamond corner linoleum, plain painted stucco, ceramic tile, polished metal, and striped wallpaper. Valis Prime RIB is a set of 215 objects in RIB format; it includes PickTure, a visual file selector which when installed with ShowPlace can display a prerendered miniature image of each Prime RIB object.

ShowPlace lets you control the format of the rendered image, both in the file size and color depth. It can also save an alpha channel mask that separates objects from their background.

The Valis Group also offers the Valis ToolKit; a package that includes the ShaderDetective and ColorMinder. ShaderDetective allows you to change the values in shader parameters and view the results on eight sample 3-D objects. The modified parameter can be saved with the shader RIB file. ColorMinder is an application that lets you view and change the color values stored in a RIB file.

Acme Animotion Group offers five libraries of NURBS-based stock clip objects. Each RIB object is accompanied by a PICT file that shows the object in rendered form. The five libraries include the Macintosh library of Mac computers and accessories, the IBM PS/2 library of PS/2 computers and accessories, the Outdoor Furniture library, the Desk Accessory library, and the Glassware library.

Acuris, Inc. offers ClipModel libraries of objects created using NURBS. ClipModel libraries are available for 3D Maps, elevation terrains, cities, architecture and design, human models, vehicles, and other objects. They are also available in a variety of formats besides RIB.

Getting a rendering out of MacRenderMan can be an exercise in patience. Even on the fastest Macs, rendering a complex image can take hours, if not days. There are, however, ways to speed up the process. Yarc Systems and StarTech both offer hardware accelerators that speed up the rendering times of MacRenderMan. Both cards install in the NuBus slot on a Mac. Both companies offer support for multiple cards to speed up the rendering times even more, and StarTech also offers network support via NetRenderMan.

Pixar's NetRenderMan allows users to utilize remote CPUs for rendering. The initial version of NetRenderMan supports UNIX workstations that support PhotoRealistic RenderMan—e.g. NeXT, Silicon Graphics IRIS or Indigo, Sun SPARC, and others. A later version of NetRenderMan will support network rendering to Macs, including the use of multiple Macs to speed up rendering.

Those of you with a programming bent can get Pixar's RenderMan Toolkit. It includes the RenderMan Interface Specification, the Procedural Interface, the Shading Language, a copy of PhotoRealistic RenderMan, a stack of manuals, and access to phone support. If that's a little too rich for your blood, you might pick up a copy of *The RenderMan Companion* by Steve Upstill, published by Addison-Wesley.

Continued on page 272

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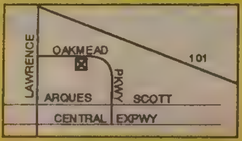
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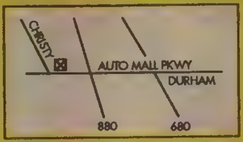
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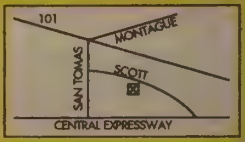
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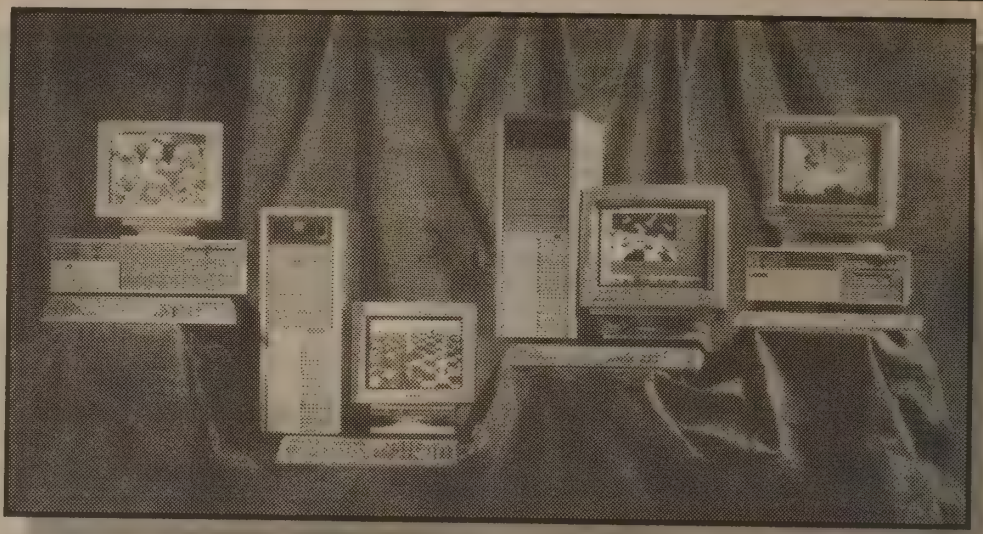

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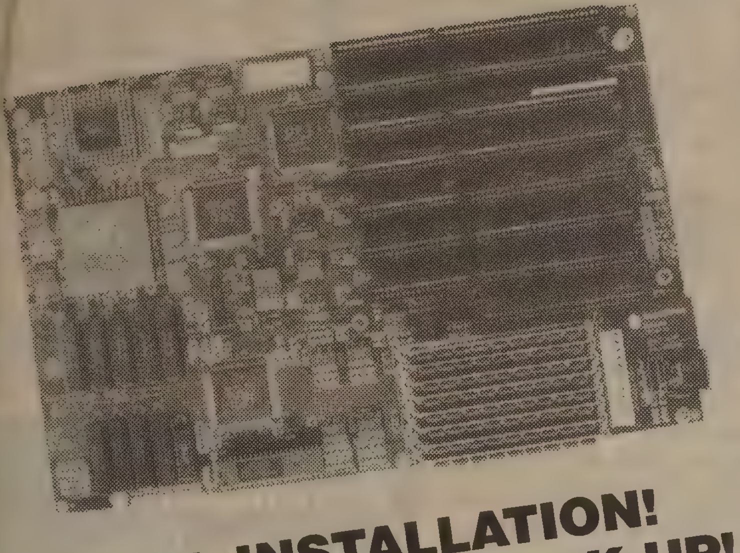

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BMUG For Beginners

What To Do Before (And After) You Buy Your First Mac

BY DAVID MORGENSTERN

B M U G

I have dedicated this month's column to new users and new users-to-be. You might attribute this to all the new members that have called the BMUG HelpLine, valiantly attempting to correctly format their first computer-generated term paper. You might imagine that I was impressed while talking to the cream of new users, the ones with heads on their shoulders, the ones that come to BMUG meetings *before* they've purchased their first Macintoshes. These reasons would have been sufficient to move the column into the beginner's lane. But the real reason is self-preservation, pure and simple.

Last month, my sister received her first computer, a hand-me-down Mac SE from my father. This was an event of great import, good cheer, and the possibility of requiring a twenty-four-hour on-call computer support service. My father (identified as the system integrator in this case) has been handling most of the support, but I've been consulted on a regular basis. So I'm going to hand her a copy of the column while it's hot off the press.

BEGIN THE BEGINNER

Here are eight wise sayings to keep in mind when you're just getting started with your Macintosh. I don't know if anything or anyone in the computer world can stand much sage advice, since most technology and wisdom is flat and stale after a year and a half. But these maxims have endured through the years and operating system revisions.

• *Even a salesman sometimes says something clever.* A computer is a major life purchase, comparable to a house, or a pussycat. The computer is a silicon extension for your brain, and you will spend thousands of hours bonded together, your face in the interface. Just as a small pebble stuck in your shoe can give you a blister, a difficult-to-use computer can seem like the devil. Your time and effort are the true investments you make with a computer.

Since most computers are incompatible, you can't simply move your computer software and the investment they represent to another house in a different neighborhood. So your first decision is a vital one—which computer should I buy? Don't blow it! Would you entrust all your hopes and dreams to a single conversation on the sales floor? Yet that's how many first-timers choose their computers.

Instead of listening to just one or two voices, talk to as many people as possible about their computers. Go to the library and paw through some current issues of magazines that specialize in the types of computers you're interested in. User group meetings are a good place to meet folks that are already doing the things that you want to do. The final step is to try the machines out in the stores.

• *A computer without software is only an expensive doorstop.* People often come to me with the question, "I have this much money to spend—which Macintosh should I buy?" They get red in the face when I tell them that they have flunked out of class on the first day. They forgot the Real Cost of a Computer Formula:

Computer = (Sum of All Hardware) + (Sum of all Software) + (Total Sales Tax).

Your computer needs software to do anything, including the things you have in mind. It's not like an optional feature on an automobile—a sun roof or air conditioning—you must buy some commercial programs for your computer.

• *Even the person with 128MB of RAM needs more.* It's always better to buy more computer, more memory and more hard disk storage than you can afford. Although this sounds like a joke, it's true.

All new computer technologies need speed and space. I remember a BMUG meeting six years ago when founder Reese Jones stated that anyone needing more than a 20MB hard disk drive was a major software pirate. Today an 80MB drive is too small for most users.

Fortunately, the cost of hardware keeps falling, but never as fast as you need it to. Upgrades almost always end up costing more than if you had bought the features as original equipment.

• *No matter that nothing happens, the Tour will give you a story to tell.* One of the disks that comes with your Macintosh is a guided

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tour disk. It has animated lessons for you to follow, to learn how to use the mouse, the Finder, and other important elements of the user interface. The first Macs came with this introductory material on an audio cassette.

The Tour is easy to dismiss. "I don't need to bother with this stuff. I picked up everything from the demonstration in the store..." I know that the BMUG HelpLine staff and volunteers, as well as technical support technicians around the country, will plead with you to take the Tour in its entirety. The lessons teach you the actions needed to maneuver around the virtual desktop, but also the language of the Macintosh interface. A Drag can be a good thing.

> **Your computer needs software to do anything, including the things you have in mind. It's not like an optional feature on an automobile—a sun roof or air conditioning—you must buy some commercial programs for your computer.**

•*Where users truly wish to go, there their cursors will manage to take them.* Don't waste time worrying that you don't know enough to get started with your Macintosh. Just jump in the water. It's cold, but you'll get used to it. And no, playing games does not count toward class credit in Macintosh 1A. I suggest that new users start with word processing. Send a letter to a loved one—they won't care if it's not formatted perfectly. Just do it!

• *The system fated to crash will crash when it's turned off.* Your system will crash and you will lose your data. This is not a horrific fantasy story to frighten the child users. It's a fundamental part of computing. Save and back up your data.

There are many good backup utility programs and strategies. Unfortunately, they all require that you actually employ them, and most users don't. We see and hear their tears on the BMUG HelpLine. The bare-bones minimum is to back up current work onto a floppy disk. I do this *every few hours* as I work, since the power often blows in our apartment.

One way of advancing this process is to have the files you're working on conveniently placed on the desktop so they're ready for a backup. I keep all my new files in a folder called the Current Folder, so they're easy to grab and drag to a floppy. Every month or so, I clear it out by moving the documents to subject-specific archival folders I've created. New users tend to keep their files in the same folder as the application that created them. This makes backing up more difficult.

• *Learning is not obtained by the shy.* Ask lots of questions. Keep asking a question, until you're satisfied that you completely understand the answer. Then ask the next one. This is especially true at a user group meeting. There will be many informed people that can help you with your specific problem, and many more people in the audience with the same question. They will also receive an answer because you were brave enough to speak up.

• *Join BMUG and your local user group.* For the past eight years BMUG has been a place where people can share their knowledge, help other people, and learn new things about new technologies and themselves. With your support, we will continue to give people good information through our meetings, HelpLine, Special Interest Groups, Bulletin Board System (BBS), Newsletter, software libraries, and publications. A user group is the one place where you never have to justify your throwing money at your computer. Someone there has spent twice as much as you—and yet has a smile on their face. Unbelievable, but true!

TIPS OF THE MACINTOSH MASTERS

I asked some BMUG know-it-alls to share a tip or two for beginners. Here are some of their efforts.

• **Bernard Aboba**, author of the *BMUG Guide to Bulletin Boards and Beyond*: "My best tip is to beware of Faxmodem Inits (Extensions). They seize the serial port, and won't let go. Use an Extension manager, and keep those pesky programs disabled until you need 'em."

• **Eric Gundrum**, BMUGer and MicroPhone sage: "Don't ever begin the name of a file with a period, which causes the Mac to interpret the file as a driver (probably not what you want). Opening such a file can seriously corrupt your system, causing unexplained crashes and other oddities. It is unfortunate that most applications don't protect against this."

• **Dana Keil**, BMUGer and Microsoft Word

What Is BMUG?

BMUG is an educational, nonprofit, consumer advocacy group organized to share information and provide critical direction to users and developers in the computer community worldwide. It is an independent advocate, not affiliated with any manufacturer, delivering trustworthy information and useful products.

Like any growing organization, it is many different things to its thirteen thousand international members. BMUG supports many Special Interest Groups (SIGs), a Bulletin Board System (BBS), free HelpLine, software library, weekly meetings, publications, and much more. BMUG also puts out a semi-annual 400+ page book that we call our "newsletter."

Our motto continues to be: *We're in the business of giving away information.*

Come and join in the dialogue at the BMUG main meeting every Thursday evening, 6–9 pm (or whenever we finish), in the Physical Sciences Lecture Hall on the UC campus. BMUG West is a meeting held monthly in the Exploratorium, San Francisco's science museum.

The BMUG Office, 2055 Center St. (a half block from the BART station) is open to the public from 9 am to 5 pm. Please come by and say hello, meet other members, and hang out.

The BMUG HelpLine, (510)540-1742, and our fax number, (510)849-9026, provide technical assistance and telephonic hand-holding during business hours (11 am–5 pm). If your question can't be answered on the spot, we try to get you in touch with someone who can help. Of course, not every problem can have a happy ending—but we try.

BMUG has one of the most up-to-date, comprehensive software libraries around with hundreds of disks filled with the latest versions of public domain or shareware programs, and HyperCard stacks. New disks are unveiled almost every week at the Thursday general meeting. BMUG also brings you the *TV-ROM*™, a fantastic collection of public domain QuickTime videos.

Our sixteen-line BBS offers many of the latest versions of files in our software library as well as news, private mail, rumors, etc. The BMUG BBS is part of the worldwide EchoMac Network on FIDOnet (161/444); by calling a local FIDOnet BBS in your area, you would then be able to get in touch with us wherever you are, as well as send mail to users everywhere! With our multiline capability, you can have access to BMUG almost twenty-four hours a day. It's easy to use, fun, and a great resource.

BMUG can be found on most electronic services. BMUG can also be reached through the international USENET network through bmug@garnet.berkeley.edu.

To get some further information about BMUG please write to: BMUG, 1442A Walnut St., #62, Berkeley, CA 94709. If you prefer to phone our business office call (510)549-BMUG, or fax (510)849-9026.

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guru: "My suggestion is to learn the difference between Close and Quit. Many new users Quit from their word processor when finished with one document, and then search through the Finder for the icon of the next file to double-click it. This procedure is really slow on a Mac Plus, SE, or Classic (not running MultiFinder or System 7), since most of the time involved in opening documents is spent loading the word processing program itself. Learn to use Open from the file menu to access files."

- **Mitch Turitz**, BMUG West member and Librarian: "Ever have the message 'Initialization Failed!' when you tried to initialize a floppy disk? Most floppies are guaranteed so that you can return them to the manufacturer for a new disk, but who wants to spend $.52 to return one floppy disk that costs less than a dollar?

"I use BAD 1.1, an Extension that waits until you have a bad floppy that fails to initialize. It then maps out the bad sectors, and gives you a usable disk, regardless of the number of bad sectors in it. Sometimes there may be as much as 100K mapped out of the disk, but the remaining 700K is usable." (Bad 1.1 is on BMUG Utilities D1 disk available from the BMUG office.)

THE DAILY PLANETBMUG

For years, one of the toughest things at BMUG has been explaining to new members how to use our BBS. It wasn't the usual cup of tea for many Macintosh users, since it ran on a PC clone. We've been hoping that someone would write a good graphic interface for our members to use. Finally, a company called SoftArc has produced such a product, First Class.

In September, the BMUG BBS became PlanetBMUG, with a friendly, full-color interface with icons, fonts, and windows. The system is running on a Mac IIfx, with a bank of sixteen speedy v.32bis modems, and over a gigabyte of online storage.

A great thing about the new software is that it allows file transfers in the background, so that you can read your mail and messages while getting the latest programs. PlanetBMUG's InterNet Link gives BMUG members a worldwide electronic mail address on the largest network of computers.

BMUG is distributing the PlanetBMUG FirstClass software to members for free, so they can visit PlanetBMUG soon. Another benefit of membership—the friendliest online service on Earth!

Upcoming Events:

October 26	BMUG West at Exploratorium museum in San Francisco. To Be Announced.
October 29	To Be Announced.
November 5	Voyager—Expanded Books Toolkit.
November 12	Microsoft—Microsoft Works 3.0; Berkeley Learning Technologies—Millie's Mathhouse (educational children's software).
November 16	BMUG South at United Way Office in San Jose. Hewlett-Packard—New Color Printer and more; Softways—Mr. File (Finder replacement).
November 19	ThinkAlong—Software DOC (pediatric medical reference).
November 26	Thanksgiving Holiday. No meeting!
November 30	BMUG West at Exploratorium museum in San Francisco. To Be Announced.

Call the BMUG Announcement Line for the latest information on BMUG meetings and great Special Interest Groups (SIGs)! (510/849-9114)

SHAREWARE SPOTLIGHT

Getting started with programs from the BMUG shareware library can be overwhelming—there's so much to choose from. The *1993 BMUG Shareware Disk Catalog* (now being published by Addison-Wesley) is an easy way to help you choose which disk to buy. It's available from the BMUG office, or a bookstore near you.

Here are a few recommended disks, with programs that will help you get started with your Macintosh:

- **Business C3.** This disk contains a number of envelope and address book utilities.
- **DAs A1.** There are more calculator programs on this disk than in a consumer electronics store. One of my favorites is Conversion, which will help you with metric measures and bar bets.
- **Fonts B10.** If you're using the TrueType technology that comes with new Macintosh models, you'll like this disk. It has a good assortment of display fonts.
- **Pictures K1.** It's impossible to select clip art for someone else, but this disk has lots of pictures of animals, including birds, horses, and dinosaurs. BMUG also has a good set of holiday season clip art in the Pictures H1–6 disks.
- **Utilities V1.** There are bad virus programs floating around and you don't want to catch one. This disk always has the latest version of Disinfectant, a free virus detection and eradication utility.

BMUG disks are $4 each from the BMUG office. ■

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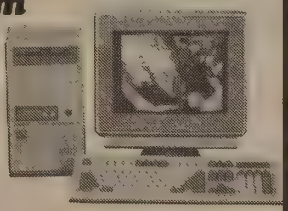

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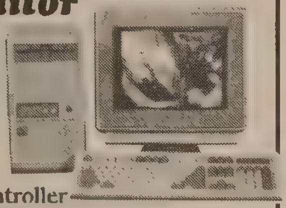

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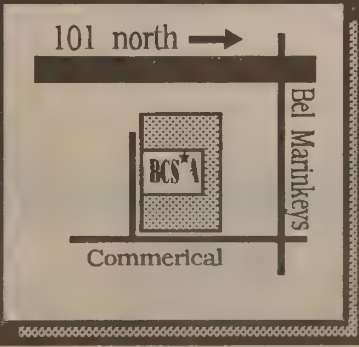

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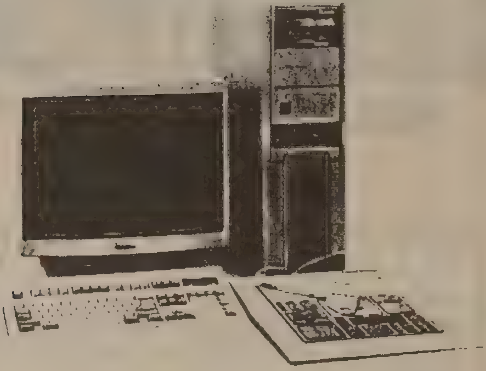

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- #9GXI graphics card. (L23)
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- DOS 5.0

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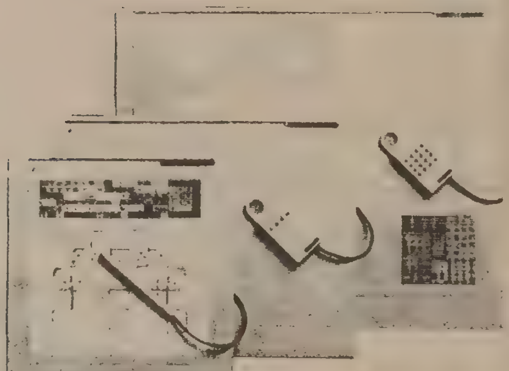

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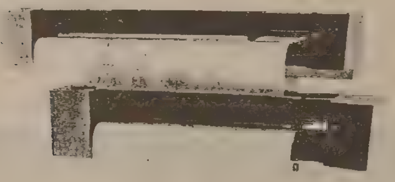

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- Built-in VGA (ET4000) $1,495

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- Color calibration software
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NEC 5D

- 20″ color monitor.
- 1280X1024 N-interlaced. $1,495

NEC 4DS

- 16″ color monitor.
- 1024X768 72Hz ref. $695

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- NTSC, PAL input / output.
- Windows, ADI drivers $895

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Drawing Data Base

Blue Ribbon Award

- Drawing data base management
- Up to 1280X1024, 256 color
- Raster file background in AutoCad
- Red-lining comments function
- Put 3D drawing in TIFF $Call

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21″ NEC 6FG	$2,495
21″ IDEK 5221	$2,095
20″ Ikegami (Trinitron)	$2,095
20″ Nanao T660i	$2,595
20″ Viewsonic 8	$1,695
20″ NEC 5D	$1,495
20″ SONY 1936	$2,395
20″ Mitsubishi 7955	$1,995
20″ Hitachi CM2085	$1,395
17″ MEG	$1,295
17″ Viewsonc 7	$1,095
17″ Seiko 1760	$1,095
17″ NEC 5FG	$1,495
17″ Toshiba 17CS01	$1,295
17″ SONY 1604S	$1,095
17″ Nanao F560i	$1,895
17″ Nanao F550i	$1,095
16″ NEC 4DS	$695
15″ NEC 4FG	$755
14″ Sampo Alphascan	$395

GRAPHICS CARD	
SPEA 1280	$1,695
#9GXI L29	$1,695
#9GXI L25	$1,395
#9GXI L23	$1,095
Artist XJS 12-16	$2,195
Artist XJS Lite	$1,495
Artist Winsprint 100+	$445
Artist Winsprint 150+	$545
Hercules GS Gold 16	$395
Hercules GS Gold 24	$595
Metheus 1104+16	$995
Metheus 1104+256	$1,095
Matrox Impression LC	Call
Matrox Impression AT	Call
Matrox MG 3D Ultra	Call
Vector 1280(for Fix freq.)	$595
Diamond Stealth	$265
ATI Graphics Ultra	$350
ATI Graphics Vantage	$275
Vivid 16 (Targa 16 comp)	$595

PLOTTERS	
Calcomp 2036(A-E)	$3,995
Calcomp 2024(A-D)	$3,095
HP Design Jet (A-E)600dpi	$6,995
HP DesignJet (A-D)600dpi	$5,895
HP 7599B (A-E)	$7,595
HP 7596C (A-E)	$6,595
HP 7595C(A-E)	$5,195
HP 7576A(A-E)	$3,995
HP 7575A(A-D)	$3,095
HP 7570A(C-D)	$2,595
HP 7475A(A-B)	$1,395
H.I. DMP162(A-E)	$3,695
H.I. DMP161(A-D)	$2,895
H.I. JetPro(A-C)	$1,895
Enter SP600(A-B)	$695
Mutoh XP-501(A-D)	$4,195
Roland GRX300(A-D)	$3,445
JDL 850XP-1M(A-C)	$2,895
AMT Accel244(A-C)	$895
PacificData InkJet(A-C)	$1,299

DIGITIZERS	
Calcomp 44X60	$1,895
Calcomp 36X48	$1,695
Calcomp 24X36	$1,495
Calcomp 18X24	$1,295
Calcomp 12X18	$645
Calcomp 12X12(P.Sen)	$595
Calcomp 12X12	$289
Calcomp 6X9(P.Sen)	$450
Summa S. MG2 42X60	$3,595
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Summa S. 2 12X12	$299
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Kurta XLC 18X24	$1,095
Kurta XLP 12X18	$535
Kurta XLP 12X12	$285
Kurta Is / One 12X12	$345
Wacom 12X12	$695

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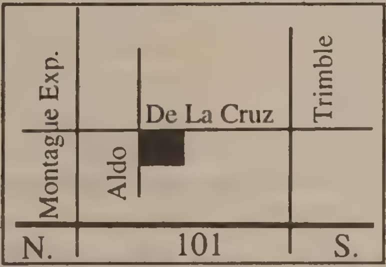

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RESOURCES

Calendar Of Events

CALENDAR LISTING CHANGES

Beginning with issue #100, the Calendar listings were reorganized into two sections. The first part includes conferences, shows, and other special events. The second presents classes, seminars, and workshops.

We hope this will help you more easily find the information you are searching for as well as stay informed of the latest events and resources that are available to you.

Thank you,
MicroTimes staff

CONFERENCES, SHOWS, AND OTHER SPECIAL EVENTS

OCTOBER

October 24 Computer Show & Sale. Solano County Fairgrounds. MarketPro. Call: (415)388-8893.

October 25 Computer Show & Sale. Hayward. MarketPro. Call: (415)388-8893.

October 26–27 Second Industry Symposium On Virtual Worlds Technology. University of Washington. HIT Lab in conjunction with the Washington Technology Center. Call: (206)543-5075.

October 26–28 Electronic Messaging '92 Conference: Golden Opportunities. San Francisco. Electronic Mail Assoc. Call: (708)875-8620.

October 26–30 Windows International Developers Conference. Santa Clara. Boston University. Call: (508)649-9731, ext. 248.

October 27 Presentation And Discussion By Ed Krol, Author Of *The Whole Internet User's Guide & Catalog*. San Francisco. Stacey's Bookstore. Call: (415)421-4687.

October 27–29 The Second Annual CD-I Publishing & Developers' Conference & Exposition. Los Angeles. Knowledge Industry Publications. Call: 1-800-800-5474.

October 28 Semiconductor Industry Conference And 16th Annual Forecast & Award Dinner. San Jose. SIA. Call: (408)246-2711.

October 30–November 1 Third Annual Macromedia International User Conference. San Francisco. Macromedia. Call: 1-800-672-2700.

October 31 Computer Show & Sale. Santa Clara County Fairgrounds. Richard James. Call: 1-800-433-7469.

NOVEMBER

November 1 Computer Show & Sale. Alameda County Fairgrounds. Richard James. Call: 1-800-433-7469.

November 1 Computer Show & Sale. Emeryville. MarketPro. Call: (415)388-8893.

November 8 Old Fashion Swap. Livermore. Computers & Ham Radio. Call: (510)447-7118.

November 10–12 GIS/LIS '92 Annual Conference And Exposition. San Jose. AAG, AACSM, ASPRS. Call: (202)234-1450.

November 14 Computer Show & Seminar. Oakland Coliseum. Richard James. Call: 1-800-433-7469.

November 15 Computer Show & Sale. Sonoma County Fairgrounds. MarketPro. Call: (415)388-8893.

November 16 Privacy In The Information Age Conference. Sacramento. Government Technology. Call: Deborah Furlow, (916)363-5000.

November 21 Computer Show & Seminar. Cow Palace. Richard James. Call: 1-800-433-7469.

November 22 Computer Show & Sale. Hayward. MarketPro. Call: (415)388-8893.

November 28 Computer Show & Sale. Solano County Fairgrounds. MarketPro. Call: (415)388-8893.

November 29 Computer Show & Sale. Alameda County Fairgrounds. Richard James. Call: 1-800-433-7469.

November 29 Computer Show & Sale. Sacramento. MarketPro. Call: (415)388-8893.

DECEMBER

December 3–5 The Open O/S Conference. San Francisco. DCI. Call: (508)470-3880.

December 5 Computer Show & Sale. Santa Clara County Fairgrounds. Richard James. Call: 1-800-433-7469.

December 6 Old Fashion Swap. Livermore. Computers & Ham Radio. Call: (510)447-7118.

NOVEMBER 5

SECOND ANNUAL SILICON VALLEY ENTREPRENEURS' CONFERENCE

Santa Clara Marriott

Get the latest inside thinking on building a business from the people who know how. Discussion topics include: Your Business and the Law, The Ins and Outs of Venture Capital, What Investment Banks Can Do for You, and Marketing Communications That Work. Trade ideas with the people who make Silicon Valley work—like people from Institutional Venture Partners and Morgan, Stanley & Co. To register, send your name, title, and address with a check for $135 to: SVEC, 555 Bryant St., Suite 192, Palo Alto, CA 94301.

December 7–8 The Personal Computer Outlook Conference. San Francisco. Technological Partners. Call: (212)696-9330.

December 7–10 Sun User Group Conference & Exhibition. San Jose. The Sun User Group and Sun Microsystems. Call: 1-800-433-1790. Email: sugshow@pcinews.lonestar.org.

December 12 Computer Show & Sale. Cow Palace. Richard James. Call 1-800-433-7469.

December 13 Computer Show & Sale. Alameda County Fairgrounds. Richard James. Call 1-800-433-7469.

December 13 Computer Show. San Francisco. Ft. Mason Shows. Call: (916)725-0228.

CLASSES, SEMINARS, AND WORKSHOPS

OCTOBER

October 24 How To Build Your Own 386 Or 486 PC Computer Class. Marin. College of Marin. Call: (510)228-3276.

October 24 & 31 PC Repair Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040.

October 24–November 7 Multimedia Exhibits For Public Spaces Class. San Francisco. SFSU. Call: (415)338-1373.

October 24–November 7 PhotoShop Intensive Course. San Francisco. Media Alliance Computer Access. Call: (415)771-7133.

Continued

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With 212 MB Hardisk
Non-Interlaced Color Monitor

Intel 80486 CPU w/ 256K Cache onboard
4MB RAM exp. to 32MB on motherboard
200MB IDE HDD (Maxtor/Conner/Western Digital)
Teac 1.2 MB & 1.44 MB FDD
14" NI SVGA CTX Monitor (Res:1024x768 @.28dpi)
ET4000 SVGA display card w/ 1MB (256 colors)
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IDE controller for 2 Hard / 2 Floppy drives
2 Serial / 1 Parallel / 1 Game I/O port
101 keys Enhanced Keyboard
Med Tower Case with 230 Watts power supply
MS & MSM Compatible Mouse (3 button)

BEST Performance

For Black Series System ADD $75.00

386

DX40 / DX33 / DX25

1135 / 1120 / 1100

With 120 MB Hardisk
4MB RAM and Color Monitor

Intel/AMD 80386-40/33/25Mhz w/ 64K Cache (0K on 25Mhz)
4MB RAM exp. to 32MB on motherboard
120MB IDE HDD (Maxtor/Conner/Quantum)
Teac 1.2 MB & 1.44 MB FDD
14" SVGA CTX Monitor (Res:1024x768 @.28dpi)
Trident 8900c display card w/ 1MB (256 colors)
Clock / Calendar built in
IDE controller for 2 Hard / 2 Floppy drives
2 Serial / 1 Parallel / 1 Game I/O port
101 keys Enhanced Keyboard
Mini Tower Case with 220 Watts power supply
MS & MSM Compatible Mouse (3 button)

BEST VALUE

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Special Offer: 80486 66Mhz/256K LOCAL BUS Black Series

$ 3485

80486 66Mhz C:> DX2

Intel 80486DX2-66 CPU, 256K Cache **LOCAL BUS** with Contaq Chipset
Maxtor 340MB SCSI Hardisk with 13ms ave. seek time
Promise Cache SCSI 16bit controller with 4MB, Average 3ms Seek time
TEAC 1.2MB & 1.44 MB floppy disk drive
16MB on board (4x9 SIMM 70ns) up to 32MB acceptable on board
Microsoft and Mouse System Mouse compatible **3 button MOUSE**
Windows Accelerator S3, 32 bit local bus video adaptor w/ 1MB on board
SOCOS BLACK 14" SVGA with 1024x768 resolution @0.28dpi, N.I.
BLACK 101 Enhanced click on/off featured keyboard
New CPU Heatsink/Fan combo kit installed
300 Watts Full Height BLACK Tower case DUAL system cooling fan

BLACK BLACK **BLACK** BLACK BLACK

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NOVELL Network

*** Network Software**

Novell Netware Lite W/ DR DOS 6.0 (2 Users Starter Kit)	$350
Novell Netware 3.11 (5/10/20/50/100/250 user)	CALL

*** Hardware / Interface Card** (Novell Certified Card)

Ethernet 10 Base-T Twisted Pair (8/16 bit)	$99/$145
Ethernet 10 Base-2 Coaxcial (8/16 bit)	$89/$135
Arcnet Twisted Pair (8/16 bit)	$45/$75
10 Base-T 12 ports Ethernet twisted pair HUB	$455
8 ports Arcnet HUB (Coax/Twisted)	$135/$155
Thin Ethernet Coax repeater (4/8/16 ports)	$499/$899/$1695
Netware Auto BOOT-ROM (8/16 bit)	$10/$12
Ethernet Pocket Adaptor (Thick/Thin/10 Base-T)	$275
Ethernet Transceiver (Thick/Thin)	$59

Servers / Stations (Std. Config, Software Loaded)

80486/33/64 8MB RAM ISA Std. Server 520MB IDE	$2350
80386/40/64 8MB RAM ISA Std. Server 520MB IDE	$1850

CALL CALL CALL CALL CALL CALL CALL CALL

UNIX Network

UNIX PLATFORM

*486/50 Mhz EISA w/256K Cache
*16MB RAM exp. to 128 MB
*EISA SCSI Controller
*540MB SCSI Hardisk Drive
*1.2MB & 1.44MB FDD
*24bit SVGA card w/ 1MB
*17" NI. SVGA Monitor (Res.:1280x1024 @0.26dpi)
*EISA 32bit Network Card
*101 Enhanced Keyboard
*3 Button Mouse
*Full Tower Case w/300 watts UL Rated Power supply

$5099

SCO UNIX

Operating Systems:
*SCO UNIX OS (1-2)
*SCO UNIX OS (3+)
*SCO UNIX OS Dev.

Communications:
*TCP/IP Run Time (UNIX)(1-2)
*TCP/IP Run Time (UNIX)(3+)
*TCP/IP Dev. (UNIX)
*Network File System

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*ODT Personal Server
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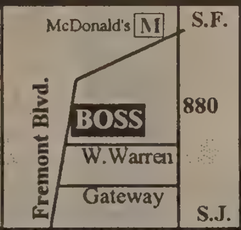
Sunday by appointment only

510-623-1580



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Saturday and Sunday by appointment only

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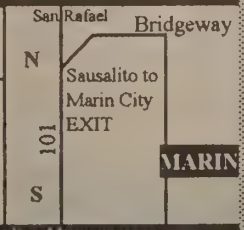


NOTE: BOSS communications & Systems Inc. reserve the right to change prices and components without notice also NOT responsible for type error, misprint or unintentional human error.

Calendar Of Events continued

October 25–29 Windows 3.1 Training Seminars And Workshops. San Jose. Descriptor Systems. Call: Joel Barnum, 1-800-528-9960. CompuServe: 70047,442.

October 26–29 Object-Oriented Analysis, Modeling, And Design Course. San Francisco. UC Berkeley Extension. Call: (510)642-4151.

October 27–28 Internetworking With Bridges And Routers Class. Menlo Park. UC Berkeley Extension. Call: (415)323-8141.

October 27–November 24 MacroMind Director Course. San Francisco. Media Alliance Computer Access. Call: (415)771-7133.

October 28 FileMaker Pro I Course. San Francisco. Media Alliance Computer Access. Call: (415)771-7133.

October 28 Intermediate Excel 4.0 Class. Emeryville. Northwest Computer Systems. Call: (510)653-0808.

October 29 Intermediate WordPerfect Class. Walnut Creek. Computer Education Center. Call: (510)937-2566.

October 29 Intro To Networks Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040.

October 30 Advanced FoxPro 2.0 Training Class. Emeryville. Northwest Computer Systems. Call: (510)653-0808.

October 30 Intermediate Lotus 1-2-3 Class. Walnut Creek. Computer Education Center. Call: (510)937-2566.

October 30 Word For Windows Class. San Ramon. MicroTek Education Center. Call: 1-800-282-7990.

October 31 How To Build Your Own 386 Or 486 PC Computer Class. San Francisco. SF State University. Call: (415)338-1205.

NOVEMBER

November 1 Intro To Lotus 1-2-3 Class. Walnut Creek. Computer Education Center. Call: (510)937-2566.

November 2 Intermediate 1-2-3 v2.3 Class. Walnut Creek. The Microcomputer Training Company. Call: 1-800-999-9654.

November 2 Windows 3.1 Class. San Francisco. The Microcomputer Training Company. Call: 1-800-999-9654.

November 2–3 How To Measure Customer Satisfaction Seminar. San Francisco. UC Berkeley Extension. Call: (510)642-6117.

November 2–13 Intensive Interactive Multimedia Class. San Francisco. Center for Electronic Art. Call: (415)956-6500.

November 3 DOS 5.0 Class. San Ramon.

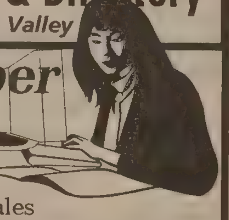
Continued

NOVEMBER 10

IN YOUR OWN IMAGE: BUILDING AN ARTIFICIAL PERSON

San Jose

Maureen Caudill, author and expert on Artificial Intelligence and Neural Networks, will discuss the issue of constructing intelligent autonomous systems. What is intelligence and how will we know when we've got it? What have we already achieved in constructing intelligent systems? When are we likely to reach that goal? How will these devices affect us when we build them? And, perhaps most importantly, how will human society fare when we share our world with our own intelligent creations built by us, in our own image? Computer Literacy Bookshops, 2590 N. First St. (at Trimble), San Jose. (408)435-1118.



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What's Happening?

Check the MicroTimes Calendar of Events in this issue for computer-related classes, seminars, and shows in your area.

4 LOCATIONS TO SERVE YOU

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BASIC SYSTEMS

System	Price
386SX-16/25/33 MHz	$279/299/315
386DX-33/40 MHz w/64K Cache	$359/369
486DX-33/50 MHz w/64K Cache	$739/969
LOCAL BUS 486DX 33/50 w/64K Cache	$779/1039
EISA 486-50 w/256K Cache	$1299

BASIC SYSTEMS INCLUDE:

- Motherboard
- CPU
- 1 MB RAM
- 1.2 or 1.44MB floppy drive
- Internal Clock/Calendar
- Math Co-Processor Sock
- Case
- Power Supply
- 101-key keyboard

COMPLETE SYSTEMS

386SX-25/33

- 2MB RAM
- 2 Floppy (5 1/4" & 3 1/2")
- 14" SVGA Monitor
- SVGA Card
- MiniTower w/230W P.S.
- IDE 2 FD/ 2HD; 2S/1P/1G Controller
- 40MB Hard Drive
- 101 Enhanced Keyboard

$789/819

386DX-33/40 64K CACHE SYSTEM

- 4MB RAM
- 2 Floppy (5 1/4" & 3 1/2")
- 14" SVGA Monitor .28
- SVGA Card
- MiniTower w/230W P.S.
- IDE 2 FD/ 2HD; 2S/1P/1G Controller
- 120MB Hard Drive
- 101 Enhanced Keyboard

$1099/1119

486DX-33/50 64K CACHE SYSTEM

- 4MB RAM
- 2 Floppy (5 1/4" & 3 1/2")
- 14" SVGA .28 dpi (1024x768)Monitor
- SVGA Card with 1MB
- MiniTower w/230W P.S.
- IDE 2 FD/ 2HD; 2S/1P/1G Controller
- 120MB Hard Drive
- 101 Enhanced Keyboard

$1479/1639

LOCAL BUS 486-33/50 64K CACHE SYSTEM

- 4MB RAM
- 2 Floppy (5 1/4" & 3 1/2")
- 14" SVGA .28 dpi (1024x768)Monitor
- SVGA Windows Accelerator with 1MB
- SVGA Card
- MiniTower w/230W P.S.
- IDE 2 FD/ 2HD; 2S/1P/1G Controller
- 120MB Hard Drive
- 101 Enhanced Keyboard

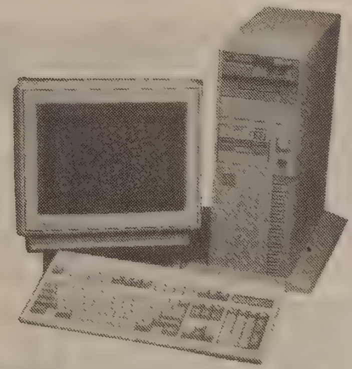
$1769/1899

VIDEO BLASTER......................$389

- Video Capture
- Graphics Overlay
- Video In a Window

Multimedia Solution For PC....$589

- Internal CD-ROM, Sound Blaster Pro, Midi Kit
- Software Includes: Microsoft Windows 3.1, Microsoft Works for Windows, Microsoft Bookshelf, Plus Creative Sounds, Software Library, & Holmes Consulting Detective



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- ▲ **Upgrade and repair your own computer at our centers**
- ▲ **One year warranty on all parts and labor**
- ▲ **We offer the best quality, best service and lowest prices**

MOTHERBOARD

Item	Price
EISA 486/50/256K USA	$1150
486/50/256K	769
486/33/64K Cache	549
386/40/64K Cache	185
386/33/64K Cache	180
386SX/16/25/33	110/117/135
286/20	89

- 100% Financing with 90 Day Free Interest
- Accept Visa and Mastercard
- Price Subject to Change without Notice
- Dealer Inquiries Welcome
- Not Responsible for Typographical Errors

MONITOR

Item	Price
SVGA (1024x768) .28	$280
SVGA (1024x768) .39	230
SVGA Viewsonic 4E	315
SVGA Viewsonic 5+	530
SVGA Non-Int .28	325
SVGA Viewsonic 6FS	529

VIDEOCARD

Item	Price
Trident 512K	$45
Trident 1MB	62
Tseng 4000 1MB	82
Speedstar w/1MB	135
Pro Designer	135
Fahrenheit	225
Diamond Stealth	225

HARD DRIVES

Item	Price
1.2/1.44 Floppy	$58/50
40MB/80MB IDE	175/229
105MB/120MB IDE	265/290
170MB/200MB IDE	365/420
340MB/540MB SCSI	740/999
Tape Back Up 120/250MB	195/255

CONTROLLER

Item	Price
IDE w/IO (2S, 1P, 1G)	$22
MFM/RLL AT/AT	50/78
DTC SCSI	120
Bustek 32-bit SCSI	345

KEYBOARD

Item	Price
Lite on	$26
Keytronic USA	36
MaxiSwitch	35
Omnikey 102/Ultra	66/99

MISCELLANEOUS

Item	Price
Mini Tower Case	$57
Medium Tower	99
Baby AT Case	79
Full Tower	135
Sound Blaster	98
Sound Blaster Pro	197
Mitsumi CD-ROM	225
Sony CD ROM	339
CD Software	CALL
1MB Simm	30
4MB Simm	125
Modem 2400 Baud	45
Fax/Modem 9600/2400	60
Printers	CALL

ComTek Computer

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Calendar Of Events continued

MicroTek Education Center. Call: 1-800-282-7990.

November 3 Intro To DOS Seminar. San Francisco. The Software Training Group. Call: (415)397-4158.

November 3 Intro To Excel 4.0 Class. San Ramon. MicroTek Education Center. Call: 1-800-464-8344.

November 3 QuarkXPress I Course. San Francisco. Media Alliance Computer Access. Call: (415)771-7133.

November 3–December 1 Intro To UNIX C Shell Programming Class. Atherton. UC Berkeley Extension. Call: (415)323-8141.

November 4 Excel 4.0, Part 1 For Windows Course. San Francisco. Corporate Solutions. Call: (415)392-1021.

November 4 FileMaker Pro II Course. San Francisco. Media Alliance Computer Access. Call: (415)771-7133.

November 4 Windows 3.1 Class. Walnut Creek. The Microcomputer Training Company. Call: 1-800-999-9654.

November 4–5 Advanced Troubleshooting For The Macintosh Seminar. San Francisco. Data-Tech Institute. Call: (201)478-5400.

November 5 Intermediate WordPerfect 5.1 Class. San Francisco. The Microcomputer Training Company. Call: 1-800-999-9654.

November 5 Intro To Excel 4.0 For Mac Class. San Francisco. The Microcomputer Training Company. Call: 1-800-999-9654.

November 5 Intro To MacDraw Pro Course. San Francisco. Corporate Solutions. Call: (415)392-1021.

November 5 Intro To Networks Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040.

November 5 Intro To WordPerfect For Windows Class. Walnut Creek. Computer Education Center. Call: (510)937-2566.

November 5 Lotus 1-2-3 v3.1 Class. San Ramon. MicroTek Education Center. Call: 1-800-282-7990.

November 6 Intro To Paradox Class. Walnut Creek. Computer Education Center. Call: (510)937-2566.

November 7 Build & Upgrade An IBM PC Clone Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040.

November 7 How To Build Your Own 386 Or 486 PC Computer Class. Los Altos. Foothill College. Call: (415)949-7722.

November 7 UNIX System V4 Administration Class. Santa Cruz. UC Santa Cruz Extension. Call: (408)748-7375.

November 7–December 5 Object-Oriented Programming Overview Class. San Francisco. UC Berkeley Extension. Call: (415)323-8141.

November 9 DeltaGraph Professional For Mac Class. Walnut Creek. The Microcomputer Training Company. Call: 1-800-999-

Continued

NOVEMBER 19

LANDA SF CHAPTER MEETING

Oakland Airport Hotel

The San Francisco Chapter of LANDA, Local Area Network Dealers Association, meets on the third Tuesday of every month. The November Dinner meeting will feature a description of NetWare Printing by Partick Corrigan. For reservations, call: Juanita Wilson, (510)895-6940.

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Solano Co. Fairgrounds
* Nov. 29 - SACRAMENTO
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* Dec. 13 - SANTA ROSA
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Calendar Of Events continued

9654.

November 9 Intro To FoxPro 2.0 Training Class. Emeryville. Northwest Computer Systems. Call: (510)653-0808.

November 10 Intro To Excel Seminar. San Francisco. The Software Training Group. Call: (415)397-4158.

November 10 Intro To Lotus 1-2-3 For Windows Class. San Ramon. MicroTek Education Center. Call: 1-800-464-8344.

November 10 Intro To WordPerfect 5.1 Class. Walnut Creek. Computer Education Center. Call: (510)937-2566.

November 10 PowerPoint 3.0, Part 1 For Windows Course. San Francisco. Corporate Solutions. Call: (415)392-1021.

November 10 Quark XPress II Course. San Francisco. Media Alliance Computer Access. Call: (415)771-7133.

November 10 & 12 Managing LANs And Internetworks Class. Santa Cruz. UC Santa Cruz Extension. Call: (408)748-7375.

November 10–17 Fundamentals Of Computer Graphics Class. San Francisco. Center for Electronic Art. Call: (415)956-6500.

November 11 Intermediate 1-2-3 v2.3 Class. San Francisco. The Microcomputer Training Company. Call: 1-800-999-9654.

November 11 Intro To FileMaker Pro 2.0 Class. San Francisco. The Microcomputer Training Company. Call: 1-800-999-9654.

November 11 Intro To MS-DOS 5.0 Training Class. Emeryville. Northwest Computer Systems. Call: (510)653-0808.

November 11 Intro To Windows 3.1 Training Class. Emeryville. Northwest Computer Systems. Call: (510)653-0808.

November 11–13 Time Line 5.0: Project Management Software Workshop. San Francisco. Symantec Training Group. Call: 1-800-786-8620.

November 12 Adobe Illustrator I Course. San Francisco. Media Alliance Computer Access. Call: (415)771-7133.

DECEMBER 3

PORTABLE COMPUTER EXPOSITION

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November 12 DeltaGraph Professional For Mac Class. San Francisco. The Microcomputer Training Company. Call: 1-800-999-9654.

November 12 Intermediate WordPerfect 5.1 Class. Walnut Creek. The Microcomputer Training Company. Call: 1-800-999-9654.

November 12 Intro To Persuasion For Mac Course. San Francisco. Corporate Solutions. Call: (415)392-1021.

November 12 Intro To Windows Class. Walnut Creek. Computer Education Center. Call: (510)937-2566.

November 12–13 Novell System Supervisor 3.11 Class. Emeryville. Northwest Computer Systems. Call: (510)653-0808.

November 12–13 PC Repair Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040.

November 14 Intro To Macintosh Seminar. San Francisco. The Software Training Group. Call: (415)397-4158.

November 14 Intro To Networks Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040.

November 14 Tuning The UNIX Operating System For Performance Class. Santa Cruz. UC Santa Cruz Extension. Call: (408)748-7375.

November 16 Intermediate PageMaker For Mac Course. San Francisco. Corporate Solutions. Call: (415)392-1021.

November 16 Intro To Quattro Pro 3.0/4.0 Training Class. Emeryville. Northwest Computer Systems. Call: (510)653-0808.

November 16–17 Project Planning Software Workshop. San Francisco. Symantec Training Group. Call: 1-800-786-8620.

November 17 Excel 4.0, Part 2 For Windows Course. San Francisco. Corporate Solutions. Call: (415)392-1021.

November 17 Intro To Ami Pro Class. San Ramon. MicroTek Education Center. Call: 1-800-464-8344.

November 17 Intro To FoxPro Seminar. San Francisco. The Software Training Group. Call: (415)397-4158.

November 17 Windows 3.1 Class. Walnut Creek. The Microcomputer Training Company. Call: 1-800-999-9654.

November 17–20 Computer Graphics And Desktop Publishing Seminar. San Francisco. The Software Training Group. Call: (415)397-4158.

November 18 Beginning Word 2.0 For Windows Training Class. Emeryville. Northwest Computer Systems. Call: (510)653-0808.

November 18 Intermediate Excel 4.0 Class. San Ramon. MicroTek Education Center. Call: 1-800-464-8344.

November 18 PowerBook Class. San Francisco. The Microcomputer Training Company. Call: 1-800-999-9654.

November 18 Windows 3.1 Class. San Francisco. The Microcomputer Training Company. Call: 1-800-999-9654.

November 18 WordPerfect Desktop Publishing Class. Walnut Creek. Computer Education Center. Call: (510)937-2566.

November 19 Accounting Systems Seminar: Tax And Managerial Reporting. Oakland. David Simon, CPA. Call: (510)893-5753.

November 19 Adobe Illustrator II Course. San Francisco. Media Alliance Computer Access. Call: (415)771-7133.

November 19 Intermediate Lotus 1-2-3 Class. Walnut Creek. Computer Education Center. Call: (510)937-2566.

November 19 Intro To FileMaker Pro 2.0 Class. Walnut Creek. The Microcomputer Training Company. Call: 1-800-999-9654.

November 19–20 PC Repair Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040.

November 20 Advanced WordPerfect 5.1 Training Class. Emeryville. Northwest Computer Systems. Call: (510)653-0808.

November 20 Intermediate Excel For Windows Class. Walnut Creek. Computer Education Center. Call: (510)937-2566.

November 20 Intermediate WordPerfect For Windows Class. Walnut Creek. Computer Education Center. Call: (510)937-2566.

November 20 PowerBook Class. Walnut Creek. The Microcomputer Training Company. Call: 1-800-999-9654.

November 21 Advanced Quark Course. San Francisco. Media Alliance Computer Access. Call: (415)771-7133.

November 21 How To Build Your Own 386 Or 486 PC Computer Class. Suisun City. Solano Community College. Call: 1-800-788-0248.

November 23 Intermediate Word For Windows Class. Walnut Creek. Computer Education Center. Call: (510)937-2566.

November 23 Intermediate WordPerfect 5.1 Class. San Francisco. The Microcomputer Training Company. Call: 1-800-999-9654.

November 23 PowerPoint 3.0, Part 2 For Windows Course. San Francisco. Corporate Solutions. Call: (415)392-1021.

November 23–24 Q&A: Database/Word Pro-

Continued

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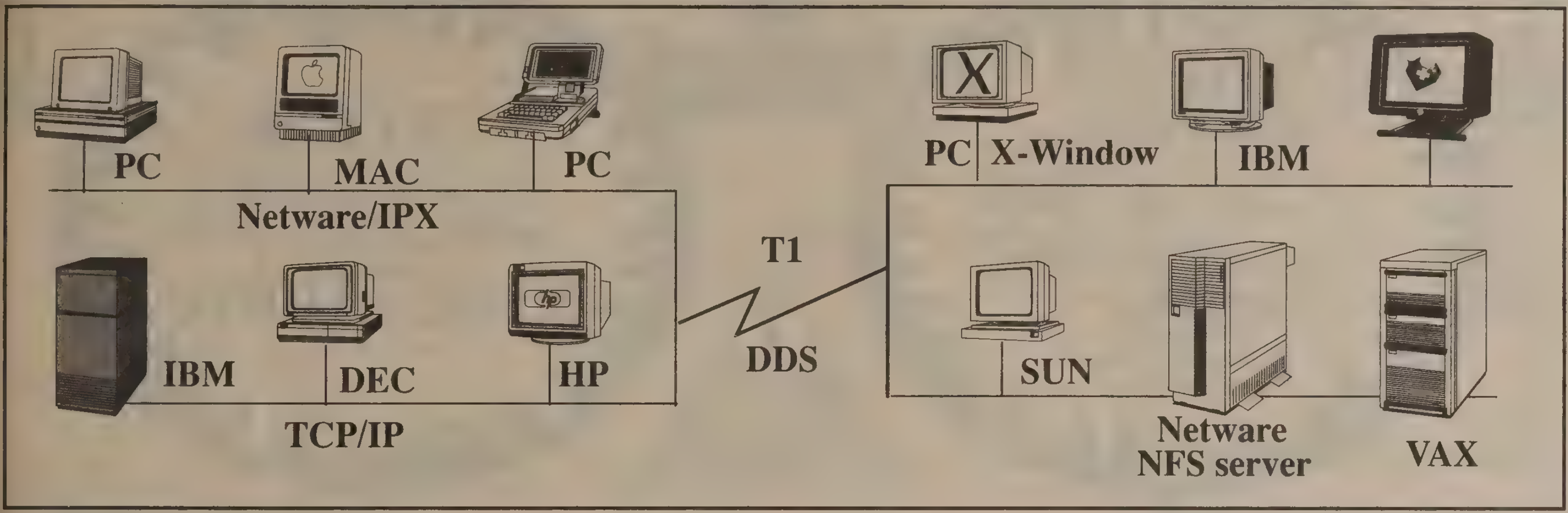

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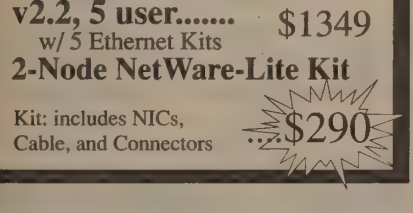

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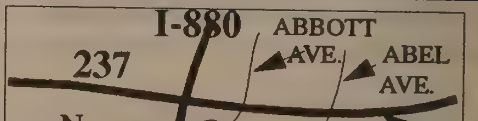

* Prices, availability and terms are subject to change without notice
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Calendar Of Events continued

cessing Software Workshop. San Francisco. Symantec Training Group. Call: 1-800-786-8620.

November 24 Computer Graphics And Desktop Publishing Forum. San Francisco. The Software Training Group. Call: (415)397-4158.

November 24 Intermediate 1-2-3 v2.3 Class. Walnut Creek. The Microcomputer Training Company. Call: 1-800-999-9654.

November 24 Intermediate WordPerfect Class. Walnut Creek. Computer Education Center. Call: (510)937-2566.

November 24 Windows 3.1 Class. San Ramon. MicroTek Education Center. Call: 1-800-282-7990.

November 30 Advanced Microsoft Word 5.0 For Mac Course. San Francisco. Corporate Solutions. Call: (415)392-1021.

November 30 Intermediate 1-2-3 v2.3 Class. San Francisco. The Microcomputer Training Company. Call: 1-800-999-9654.

November 30 Intro To WordPerfect For Windows 5.1 Training Class. Emeryville. Northwest Computer Systems. Call: (510)653-0808.

DECEMBER

December 1 FileMaker Pro I Course. San Francisco. Media Alliance Computer Access. Call: (415)771-7133.

December 1 Intro To Networks Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040.

December 1–4 C Language Programming Class. Santa Cruz. UC Santa Cruz Extension. Call: (408)748-7375.

December 1–15 Adobe Illustrator Class. San Francisco. Center for Electronic Art. Call: (415)956-6500.

December 2 FileMaker Pro II Course. San Francisco. Media Alliance Computer Access. Call: (415)771-7133.

December 2 Intermediate WordPerfect 5.1 Class. Walnut Creek. The Microcomputer Training Company. Call: 1-800-999-9654.

December 2–4 Time Line 5.0: Project Management Software Workshop. San Francisco. Symantec Training Group. Call: 1-800-786-8620.

December 2–23 Integrated Media Production II Class. San Francisco. Center for Electronic Art. Call: (415)956-6500.

December 5 Build & Upgrade An IBM PC Clone Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040.

December 5 How To Build Your Own 386 Or 486 PC Computer Class. Daly City. Skyline College. Call: (415)574-6563.

December 5 & 12 Korn Shell Language Programming Class. Santa Cruz. UC Santa Cruz Extension. Call: (408)748-7375.

December 5–19 Principles Of Animation Class. San Francisco. Center for Electronic Art. Call: (415)956-6500.

December 7–8 PC Repair Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040.

December 7–8 Project Planning Software Workshop. San Francisco. Symantec Training Group. Call: 1-800-786-8620.

December 8–9 QuarkXPress Class. San Francisco. Center for Electronic Art. Call: (415)956-6500.

December 11 Intro To Networks Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040.

December 12 How To Build Your Own 386 Or 486 PC Computer Class. Martinez. Martinez Adult School. Call: (510)228-3276.

December 12 & 19 PC Repair Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040.

December 14 Intro To Networks Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040.

December 14–15 Q&A: Database/Word Processing Software Workshop. San Francisco. Symantec Training Group. Call: 1-800-786-8620.

December 14–21 Intermediate PhotoShop Class. San Francisco. Center for Electronic Art. Call: (415)956-6500.

December 16 Build & Upgrade An IBM PC Clone Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040.

December 17 Accounting Systems Seminar: Tax And Managerial Reporting. Oakland. David Simon, CPA. Call: (510)893-5753.

December 17–18 PC Repair Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040.

December 28 Intro To Networks Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040.

December 30 Build & Upgrade An IBM PC Clone Workshop. Oakland. Excel Micro Solutions. Call: (510)836-2040. ■

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1MGX9-8	25

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1MGX8-8	27
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Santa Clara, CA 95054

RESOURCE LISTING CHANGES

As electronic bulletin boards continue growing, system operators are adding phone lines that include additional area codes. Beginning with issue #100, *MicroTimes* introduced a "Multi-Zone" category for BBSes with access phone numbers in multiple area codes.

Thank you,
MicroTimes staff

209

BerthaBoard. (209)823-0093. 1200–14,400 V.32. Three lines, 4.5GB, 65,000 files, lrg. msg. base. [Exp. #102.]

408

A32 Macintosh User Group BBS. (408)263-0299. 24 hrs., 2400. Second sight, members only. Voice: (408)263-0398. [Exp. #102.]

Amateur Action BBS. (408)263-3393. 8-N-1, 1200/2400/9600. 100% Adult Amateur GIF files, eight lines. [Exp. #103.]

Amiga (The Dungeon) BBS. (408)384-6370. 24 hrs., 1200/2400. Games, files, info on Amiga viruses, some IBM files. Sysop: Garnett Sanders. [Exp. #102.]

Andy's Tavern. (408)223-1571. 24 hrs., 2400. Two nodes. IBM, Mac utils, GIFs. Free, for now. Sysop: Andrew N. [Exp. #103.]

Apple Byte GS. (408)578-3201. 24 hrs., 1200/2400/9600/14,400. Apple II Support BBS, member FVNet, running Metal/FutureVision, 685MB. Free. Sysop: Jim Buchanan. [Exp. #103.]

Atomic Dog BBS. (408)223-1931. 8-N-1, 1200/2400/9600/14,400. 660MB HD & CD-ROM. Free access. [Exp. #103.]

Bare Bones BBS. (408)272-2173. 8-N-1, 24 hrs., 9600. Two lines, Mac file transfers. Free, instant validation. Sysop: L'il John. [Exp. #103.]

Bay Area Atari User Group (BAAUG) BBS. (408)986-0215. 8-N-1, 24 hrs., 300/1200/2400. [Exp. #101.]

BayNar-Net. (408)926-8547. 24 hrs., 2400. Model rocketry, astronomy, Ham, kids. Family oriented, NAR affiliated. Sysop: Phil Hayton. [Exp. #103.]

The Beggar's Tomb. (408)243-TOMB. GIFs, stories, and animation for adult orientations. Sysop: The Grim Reaper. [Exp. #102.]

Berryessa Central. (408)946-5642. 8-N-1, 1200/2400/9600/14,400. All computers, interesting message sections. Sysop: Mark Shapiro. [Exp. #103.]

Blue Smoke BBS. (408)265-4600, (408)269-4127. Adult files, SIGs. Free telex with membership. Sysop: Timber Wolf. [Exp. #102.]

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board8. (408)338-7052, 338-7954. 24 hrs., Full network news and worldwide mail via UUCP. Free. [Exp. #103.]

Burn This Flag. (408)363-9766. 9600. Topics from Abortion to Zionism. NIRVANAnet. No fee. [Exp. #102.]

C-Message Weighting Messaging System. (408)377-7441. 1200/2400/9600/14,400. Radio scanners, telephony, frequency database, aviation, PCX clip-art. Sysop: Alfred Deisner. [Exp. #103.]

Code Room. (408)266-3818. 8-N-1. A Programmer's BBS. Tons of C files. Win & OS/2 prog. conf. FidoNet 1:143/326. Sysop: Ramin Akhbari. [Exp. #101.]

Comp-U-Ease. (408)286-8332. 24 hrs., Multiline, ACAD/Engineering, RIME regional email hub. Sysop: Stuart Smith. [Exp. #102.]

Computers For Christ Headquarters. (408)363-8959. 24 hrs., 300/1200/2400/9600/14,400. Dedicated to Christian topics and examination of other religious groups. Over 80MB of text files on religious groups of the world. [Exp. #101.]

Creative Labs, Inc. BBS. (408)428-6660. 8-N-1, 1200/2400/9600/14,400. Technical support BBS for Sound Blaster, Video Blaster, and other Creative Labs products. Sysop: Bob Hogg. [Exp. #103.]

Cruzio. (408)423-9995. 8-N-1, 1200/2400/9600. Santa Cruz county email, USENET and scruz newsgroups, databases, files, MUD/chat. Sysop: Peggy Dolgenos. [Exp. #102.]

Crystal Caravan BBS. (408)263-0782. 8-N-1, 1200/2400/9600/14,400. Online games, PC files, Amiga .MOD files, etc. Free. Sysop: Dynax. [Exp. #102.]

The Dark Side. (408)245-SPAM. 24 hrs. Free access to Usenet and UUCP mail. Since 1985. Internet: darkside.com. [Exp. #102.]

Dating Tree BBS. (408)946-1431. 16 lines, online chat, email, matchmaking, and more. Since 1988. Sysop: Ima Gnome. [Exp. #102.]

DC-To-Light. (408)262-5150. 8-N-1, 24 hrs., 300/1200/2400/9600. MS-DOS, CAD, UNIX, WIN, LAN & HAM: Conferences and email. Sysop: Fred Townsend. [Exp. #103.]

Eat My Shorts. (408)737-1885. 1200/2400/9600. Msgs, files, games, adult, etc. Many help screens for newcomers. FidoNet. [Exp. #101.]

The Electric Pages. (408)253-4280. 300/1200/2400. Commercial and private advertising. Select by category or key words. Voice: (408)253-1709. Sysop: Contemporary Communications, Inc. [Exp. #103.]

The Enclave. (408)338-9754. 8-N-1, 300/1200/2400. Writers' BBS, etc. Local forums, Usenet news, UUCP mail. Free. Sysop: Raven. [Exp. #102.]

The Engineers' Club. (408)265-3353. 8-N-1, 24 hrs., 1200/2400/9600/14,400. Technical files, messages, and users. Sysop: Robert K. Griffith. [Exp. #103.]

Escape To Other Worlds BBS. (408)956-1750. 8-N-1, 1200/2400/9600/14,400. SF/fantasy, comics, games, msgs. Three lines, D/L files. Mac and PC GIFs. [Exp. #102.]

Fun Seekers. (408)379-0958 (300–14,400), 379-9680 (300–38,400). 8-N-1, 24 hrs. IBM utils, games, adult, bus. ed., fitness, and more. Designed for the whole family. [Exp. #102.]

Garlique Graphics. (408)847-0665. 24 hrs., 2400/9600. When only the best will do. [Exp. #103.]

Gizmonic BBS. (408)445-1203. 8-N-1, 1200/2400/9600/14,400. Games, utils, GIFs, Win, animations, aviation, adult files. [Exp. #102.]

The Haunted Castle BBS. (408)226-1052. 2400/9600. Two nodes, 600MB online. [Exp. #102.]

HeartBeat Earth. (408)257-2306. 8-N-1, 300/1200/2400. Silicon Valley's Green Online Interactive publication. TechNet, WildNet, files. Sysop: Marcus Johnson. [Exp. #103.]

Infoserve Connections. (408)243-2102. 8-N-1, 24 hrs., 2400. UUCP/Usenet/email for DOS, Mac, and 386/UNIX. Sysop: B. Oesterreich. [Exp. #102.]

The I/O Temple. (408)427-3453. 8-N-1, 1200–14,400. Msg bases, online games, and more. FidoNet 1:216/513. Sysop: Armand. [Exp. #101.]

The Land Of Garg BBS. (408)378-5108. 8-N-1, 24 hrs., 1200/2400. Internet mail, regional newsgroups, religious file section—Roman Catholic emphasis. Sysop: Bob Van Cleef. [Exp. #103.]

Lynn-Western Newswires. (408)778-5994 & 778-9656. 8-N-1, 24 hrs., 1200/2400. FidoNet 1:143/304. Professional information on technology, management, and worldwide investment news. Stock

Continued

BAY AREA BBSes

By Kathleen Creighton

Bulletin Board Networks For Sysops And Others

The great State of California and its online residents now have the opportunity to network through **CALNet**, a new network encompassing the eight major California geographic areas. **Crystal Palace BBS** sysop George Britt founded the network in July for the stated purpose of allowing BBS operators within the state to share information of interest to themselves and their users. It's also a way to make new friends around the state and link up inexpensively with old ones, and to expand participation in special interest topics.

Available CALNet message areas include CAL BBS for statewide BBS ads; CAL WATCHDOG, government and legislation discussions; CAL BIZ, California business; CAL LAW, procedural law; and CAL SCIENCE, scientific discussions. As more BBSes join the mix and moderators for specific groups step forward, Britt hopes to add more general-interest message areas like CAL TRAVEL, CAL SKIING, or CAL EARTHQUAKE.

CALNet serves over forty BBSes statewide, and while there are several nodes in the 408 area, Britt would welcome more interest from BBS operators in area codes 415 and 510.

Regional Information:

Area Code 408 (Region 1: San Francisco Bay Area): **IPECS Inc. BBS** (San Jose) (408)298-2740, 2400 baud (9600 baud available), 8-N-1, Todd Looney, sysop; or

Area Code 415/510: **Crystal Palace BBS** (San Francisco), (415)564-5623, 2400 baud (9600 baud available), 8-N-1, George Britt, sysop.

Area Code 707 (Region 2: North Coast): **Corpus Christi BBS** (Napa), (707)252-4830, 2400 baud (9600 baud available), 8-N-1, Gary Bradford, sysop.

(Regions 3 and 4, Northern California and Central Coast, respectively, not yet assigned)

Area Code 916 (Region 5: Sacramento Valley Region): **The Ultimate BBS** (Sacramento), (916)334-2773, 2400 baud, 8-N-1, Brian Gibbons, sysop.

Area Code 209 (Region 6: Central Valley): **Root Connection** (Modesto), (209)576-1606, 2400 baud (9600 baud available), 8-N-1, Larry Beyers, sysop.

Area Code 310/714/818 (Region 7: Los Angeles): **42 BBS III** (Carson), (310)549-5539, 2400 baud (9600 baud available), Alex Sandor, sysop.

Area Code 619 (Region 8: San Diego): **UNI-ROM BBS** (San Diego), (619)279-4774, 2400 baud (9600 baud available), 8-N-1, Danny Klopfer, sysop.

Bay Link

Bay Link is primarily a San Francisco BBS network founded among friends to introduce each other's

Continued

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86DX 25MHz NC	$143	486DX 33MHz w/256K	$560
86DX 33MHz NC	$159	486DX 50MHz w/256K	$699
86DX 33MHz w/64K	$168	486DX2 50MHz w/256K	$555
86DX 33MHz w/256K	$192	486DX2 66MHz w/256K	$950
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86DX 40MHz w/256K	$215	486DX EISA 50MHz w/256K	$955

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286 20MHz	$239	$639	$699	$749	$879
386SX 25MHz	$289	$689	$749	$849	$980
386DX 25MHz NC	$339	$739	$799	$799	$979
386DX 33MHz NC	$359	$759	$819	$869	$999
386DX 33MHz w/64K	$352	$752	$812	$862	$992
386DX 33MHz 264K	$379	$779	$839	$889	$1,019
386DX 40MHz 64K	$356	$756	$816	$866	$996
386DX 40MHz 264K	$380	$780	$840	$890	$920
486SX 20MHz NC	$367	$767	$827	$877	$997
486SX 25MHz NC	$387	$787	$847	$897	$1,027
486DX 33MHz w/64K	$725	$1,125	$1,195	$1,245	$1,365
486DX 33MHz 256K	$749	$1,699	$1,199	$1,299	$1,399
486DX 50MHz 256K	$860	$1,260	$1,320	$1,370	$1,499
486DX EISA 33MHz 256K	$980	$1,380	$1,440	$1,490	$1,625
486DX EISA 50MHz 256K	$1,120	$1,510	$1,580	$1,630	$1,860
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Local Bus 486DX50MHz 256K	$980	$1,380	$1,440	$1,490	$1,665uxr20

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UltraStore 32-Bit SCSI HD/FD	$450
Adaptec 1742 32-Bit SCSI HD/FD	$475
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Market data online. [Exp. #103.]

Magic Kingdom BBS. (408)245-3961, 253-2426. 16 lines, teleconference, multiplayer games, SIGs, files, and more. [Exp. #102.]

Mail Stop. (408)257-1919. 8-N-1, 24 hrs., 300/1200/2400. Free, private email and SIG system. Internet mailboxes avail. [Exp. #101.]

Mongoose BBS. (408)733-3034. 24 hrs., 1200–38,400. We're back, better than ever! Over 2GB of space and files. Free access. Sysop: Robert Yag. [Exp. #101.]

Monterey Gaming Systems. (408)655-5555. 300–14,400. Eight lines, conferences, email, messages, custom games. Free. [Exp. #102.]

Moose Is Loose BBS. (408)773-9573. 1200/2400/9600. The best message base under Sunnyvale's fruit can. SASE reg. required for file access. Sysop: John Giever. [Exp. #103.]

Mountain Retreat. (408)335-4595. 1200–14,400. 660MB, FidoNet member, specialty Turbo Pascal. Sysop: John Jamieson. [Exp. #101.]

The Mud Hole BBS. (408)739-8297. Messages, great door games, win extra time in weekly tournaments. [Exp. #102.]

Nitelog BBS. (408)655-1096. 24 hrs., 300–16,800. Files, adult, 11 lines, 4.9GB. Sysop: Karl Van Lear. [Exp. #101.]

Pacific Exchange BBS. (408)946-8561. 12 lines and over 40,000 IBM files. Since 1986. [Exp. #101.]

PIE BBS Loves High Speed! (408)733-4670. 8-N-1, 300/1200/2400/9600/14,400. Three lines, Macintosh, Apple II & GS, MS-DOS/Windows. Sysop: Clay Walker. [Exp. #102.]

Ring Of Fire BBS. (408)739-8753 (2400), 739-8371 (9600). BBS for United Sysop's Association and Silicon Valley Novell Users Group. Since 1983. Sysop: Bill Strouse. [Exp. #101.]

The Rising Storm. (408)739-8693. 8-N-1, 14,400. Survival echos and files, emergency prep, firearms, politics, and more. Sysop: Kirk DeHaan. [Exp. #103.]

Second Source Parts, Inc. (408)727-1993. 8-N-1, 24 hrs., 300/1200/2400. Medical equipment, new & used parts, consumables, info & more. [Exp. #103.]

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Shareware Connection BBS. (408)261-3278, 261-2821. 1GB+ adult files, 1GB+ IBM files. PC-SIG/PC-PIX CD-ROM, shareware magazine. [Exp. #101.]

The Shrine BBS. (408)747-0778. Magick, religions, and sex. Adult and women's only areas by request. All lifestyles welcome. Sysop: Tom Joseph and Junell Zzz. [Exp. #102.]

ShrinkTank BBS. (408)257-8131. 8-N-1, 300/1200/2400 & 9600 for SuperModem users. Mental Health, Psychology, Men's Issues, Metrolink conferences. All users welcome! Sysop: Rob Bischoff, Ph.D. [Exp. #103.]

The Shuttle BBS. (408)998-2659. 24 hrs., 1200/2400/9600/14,400. Tons of multimedia files, GIFs, Win 3.x, midi, wav, SB/SBPro support. Sysop: Michael Vedda. [Exp. #103.]

The Silicon Connection. (408)492-9700. 24 hrs., 300/1200/2400. Electronic PenPal Network, 16 lines. [Exp. #103.]

Silicone Valey BBS. (408)946-3792. 8-N-1, 24 hrs., 1200/2400. Mac/IBM graphics, games, utilities. G–XXX. No fees. Sysop: Alan Ginsburg. [Exp. #101.]

Success BBS. (408)267-8325. 8-N-1, 1200/2400. S. Bay Entrepreneurs Assoc. BBS. Business opportunities, job shop, buy/sell, ads, personals. Networking for success. Free. [Exp. #103.]

The Support Network BBS. (408)259-0297. 8-N-1, 2–8 pm, 1200/2400/9600. Community computing for Santa Clara County. Sysop: Frank Arnold. [Exp. #102.]

SVCS BBS. (408)956-1204. 8-N-1, 24 hrs., 300/1200/2400/9600. Features MS-DOS, CAD, UNIX, GIF, WIN, LAN, & HAM. SIG conferences and email. Sysop: Fred Townsend. [Exp. #102.]

TeleGraphics. (408)737-8720, 737-1703. DTP, graphic art, multimedia, general interest, Mac based. Free. [Exp. #102.]

Texas Instruments PCs. (408)296-2503. 24 hrs., 2400. Message base, user group info & software for TIPC. Sysop: Mark Cantrell. [Exp. #102.]

Thunder Mountain BBS. (408)266-4553. 8-N-1, 300/1200/2400. Two lines, chat, files for all, email, matchmaker—all free. Sysop: Sysflyer. [Exp. #102.]

The Tower. (408)288-7651. 2400. Files, doors, msgs, 240MB HD, 545 CD. Free. Sysop: Dance Man. [Exp. #103.]

The Village. (408)229-0706. 300/1200/2400/9600/14,400, USR-HST V.42bis. Online games, 400MB. Full access with first call. Sysop: Michael Wilson. [Exp. #101.]

The Who Knows? BBS. (408)262-3634 (14,400), 262-1364 (9600). Specializing in worldwide messaging and online games. Sysop: Johnny Bowen. [Exp. #103.]

415

4 Corners BBS. (415)989-7957. 24 hrs., 300/1200/2400/9600/14,400. Online games, 5000+ files, msgs, doors. Free access, low rates. Sysop: Stephen Kurtz. [Exp. #103.]

38 North, 122 West. (415)343-7517. 8-N-1, 9600. Free boat-for-sale ads, psychotherapy, diplomacy game, interracial couples. Fido coming soon. [Exp. #101.]

ABACUS (Atari Bay Area Users Society). (415)587-8062. 300/1200/2400. For 8-bit and ST/TT users. [Exp. #103.]

ALIEN BBS. (415)359-8774. 8-N-1, 24 hrs., 1200–14,400. Amiga/IBM/Mac info. Adult

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users to other local boards. It's unusual in that one of the links takes the form of each BBS carrying the main message area of each member BBS, although the individual BBSes are quite different from each other. The option of eight different BBSes to call makes it easy to link up with other participants, also handy when a sysop needs to make an announcement about his or her member board being offline.

Coconino County BBS (San Francisco), (415)861-8290, 2400 baud, 8-N-1, Peter Wadsworth, sysop.

Israeli Byte (San Francisco), (415)550-1318, 2400 baud, 8-N-1, Edahn Golan, sysop.

Network 2000 (San Francisco), (415)474-4523, 2400 baud, 8-N-1, Helton Lim, sysop.

PC GFX (San Francisco), (415)337-5599, 2400 baud, 8-N-1, Lawrence Liu, sysop.

Seahunt BBS (San Francisco), (415)431-0473, 2400 baud, 8-N-1, Michael Nelson, sysop.

Transporter BBS (San Francisco), (415)441-0616, 2400 baud, 8-N-1, Lt. Col. Steve Clifford, sysop.

Ultramagnetic Empire (San Francisco), (415)641-9862, 2400 baud, 8-N-1, Matthew Fleischman, sysop.

Vidgame BBS (South San Francisco), (415)737-9939, 2400 baud, 8-N-1, George Hassmer, sysop.

NIRVANAnet™

& the Temple of the Screaming Electron (which bills itself as "raw data for raw nerves"), cited in this column before as home of the irreverent and off-the-wall message area name (and currently the home of "My Hair is Very Pretty"), is the milk and honey mothership of an equally off-the-wall Bay Area network called NIRVANAnet.

BBS membership in NIRVANAnet is small and seems to be quite fluid. Member boards agree to allow immediate validation of users and the use of handles. An eccentric BBS name and an ability to cleverly label message areas ("Tell me about your mother"; "My CPU Kicks Butt") seem to be part of the gestalt.

& the Temple of the Screaming Electron (Walnut Creek), (510)935-5845, 2400 baud, 8-N-1, Jeff Hunter, sysop.

Burn This Flag (San Jose), (408)363-9766, 2400 baud, 8-N-1.

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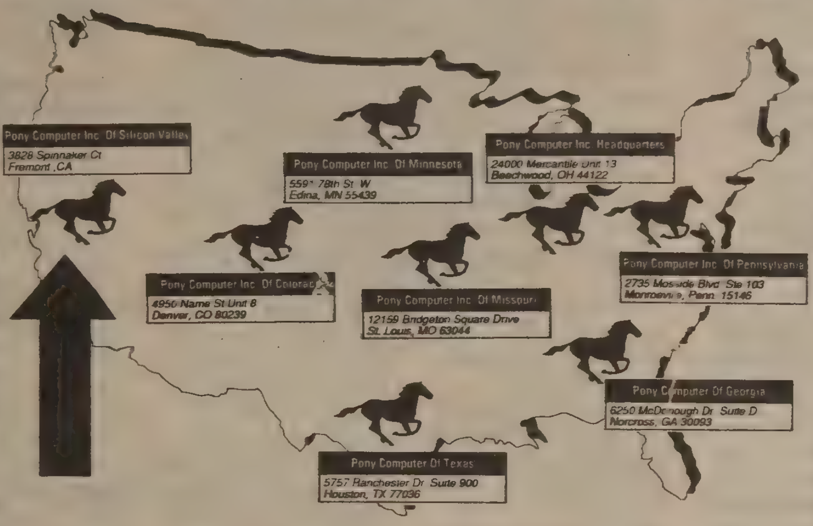
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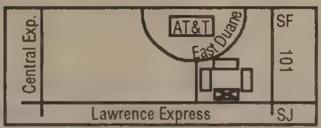

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Linkages International. (510)547-2162. 8-N-1, 24 hrs., 300/1200/2400. News, games, African and African American Culture. [Exp. #103.]

The MAD Board. (510)839-7410. 14,400. Online games, TW2002, EC, GWar, and The Pit. Free, 90 min./day. [Exp. #102.]

Millennium BBS. (510)828-4153. 1200/2400. DOS shareware, games, and messages. Sysop: Terry Swiers. [Exp. #102.]

The Mines Of Moria. (510)559-9151. 1200. Role-playing games, msg bases, online games, TCH ANSI Group. [Exp. #103.]

Mutant Valley BBS. (510)294-9052. 24 hrs., 300/1200/2400. Multiline information exchange. [Exp. #102.]

The New-Ark BBS. (510)796-0947. 24 hrs., 300/1200/2400/9600. Games, Tradewar. Reg required. Sysop: Hiram Wolf. [Exp. #102.]

NightLine BBS. (510)234-1053. Home of Vetlink #22, nationwide veterans infor, supports echo conferences, over thirty veteran.military persons related conferences. Free. Sysop: Jon Mankowski. [Exp. #103.]

Off Broadway's AutoCAD BBS. (510)547-5264. 8-N-1, 300/1200/2400/9600. Dedicated to supporting AutoCAD. Message base free and non-members can download one file a day. Unlimited membership, $50/yr. Sysop: Robert Schutz. [Exp. #102.]

The Party Wherehouse BBS. (510)256-9809 (1200/2400), (510)256-8979 (9600). 8-N-1, 24 hrs. Eight networks, over 150 message bases. [Exp. #102.]

The Phantom Zone BBS. (510)538-9586. 8-N-1, 24 hrs., 300/1200/2400. Free access. Sysop: Paul Graydon. [Exp. #102.]

Quasatron BBS. (510)846-6085. 24 hrs., 9600 V.32. IBM, electronics, two-way & amateur radio, games, adult files, etc. Telecom industry professionals welcome. Reg not required. Sysop: KC Mazie. [Exp. #103.]

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Records Dept. BBS. (510)426-0470. 8-N-1, 2400. Amiga, IBM, and Mac—files, chat, Fidonet. Extras for subscribers. Sysop: Paul Tibbals. [Exp. #102.]

Sir James BBS W/ Magick Resource Center. (510)261-6567. 300–14,400. Magick, Pagan, SCA Music, Adult, MIDI, Music, Soundblaster, Windows, games. Reg req., free. Sysop: Sir James. [Exp. #102.]

Terminal One BBS. (510)432-2461. Soundblaster files, aviation and other GIFs, animation files. Wildcat 3.51, WWIV 4.21a. [Exp. #102.]

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WizardClan. (510)376-3805, 686-6053, 525-5332. 8-N-1, 1200/2400/9600/14,400. Internet, Usenet, WWIV-Net, WWIV-Link, Fido, Adult-Net, Icenet, 100+ msg bases, games, and more. [Exp. #102.]

Worldview BBS. (510)676-2919. 8-N-1, 24 hrs., 1200–14,400. Reformed Christian perspective, files/discussion on philosophy, public policy. $49/yr. Sysop: Bill Gram-Reefer. [Exp. #102.]

707

The Black Rose. (707)557-6444. 24 hrs., 300/1200/2400. Commodore 64/128 BBS, running Image v1.2a and a NISSA Network Assoc. ANSI graphic menu, health msgs. Sysop: Captain Keelhaul. [Exp. #101.]

Dobbs Enterprises. (707)427-0277. 300/1200/2400/9600. Part of WIVInet conference. 24,000+ files. [Exp. #102.]

Recommended BBS. (707)448-2225. 24 hrs., 300/1200/2400. Multiuser games, teleconference, conversational and technical areas, 16 lines. All welcome. Sysop: Jay C. Parangalan. [Exp. #101.]

Sonoma Online. (707)545-0746. 60 echo-mail SIGs, UUCP email, 9K files, alt energy/home poser magazine. User supported, free. [Exp. #103.]

UNIX Online. (707)792-0402, 795-1721. 24 hrs., Usenet access. For UNIX, Amiga, Mac, and DOS users. [Exp. #101.]

User Friendly BBS. (707)645-8894. 8-N-1, 24 hrs., 9600. IBM/Amiga, Linet, msgs, sci-fi/fantasy info and reviews, doors. Sysop: Jim K. [Exp. #101.]

MULTI-ZONE

Fantasy Network. (408)985-1529, (408)732-4908, (415)365-7002, (415)321-3661, (415)573-1063, (415)244-9218, (415)928-4781. Online, multiuser, Interactive D&D style, fantasy adventure game. Mid-Peninsula, South Bay, North Bay, and San Mateo. [Exp. #102.]

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Portal Communications. (408)725-0561, (300–2400); (408)973-8091, (9600–57,600); (415)965-8095, (300–57,600). 8-N-1, Worldwide X.25 online, BBS & UUCP connections. Voice: (408)973-9111. [Exp. #103.]

Public Domain Software Exchange. (415)571-6911, (707)444-9203. 8-N-1, 24 hrs., 1200/2400. Multiple message areas, large file library, chat, two lines. [Exp. #102.]

ASSOCIATIONS

American Association For Artificial Intelligence (AAAI). Call: (415)328-3123. Email: membership@aaai.org. [Exp. #104.]

The Association For Worldwide Software Support Management. Meetings: 2nd Tues., Milpitas Sheraton. Call: Mikael Blaisdell, (415)865-1323. [Exp. #105.]

Association Of Database Developers (ADD). Meetings: 2nd Thurs., 7:00 pm, The Gatehouse, Fort Mason Center, San Francisco. Organization for professional xBASE language systems developers. Membership $50/yr or $5/meeting. Call: JoAnn, (415)863-6706. [Exp. #101.]

The Black Data Processing Associates, Silicon Valley Chapter. Meetings: 4th Thurs., 6:30 pm, Amdahl Corp., Sunnyvale. Call: Doug Jones, (408)737-5999. [Exp. #101.]

Computer Professionals For Social Responsibility. Meetings: 2nd Wed., 7:30 pm, UC Berkeley, Evans Hall, Rm. 608-7. Call: Judy Stern, (510)643-7499. [Exp. #105.]

Data Processing Management Association. Call: (415)978-0868. [Exp. #105.]

IEEE Computer Society, San Francisco Chapter. Meetings: 3rd Wed. Call: (415)905-4400. [Exp. #103.]

Independent Computer Consultants Association, Northern California Chapter. Meetings are open to all. Only national trade assoc. comprising non-aligned working computer professional with in-the-trenches experience. Call: ICCA, (415)441-2948. [Exp. #102.]

International Network Of Women In Technology. Dedicated to significantly increasing the leadership of Women in Technology in industry and government. Call: Dr. Carolyn Turybfill, (415)336-1007. Email: Carolyn Turybfill-@Eng.Sun.COM. [Exp. #102.]

Networkers' Toastmasters. Meetings: Every Tues., noon–1:00 pm, 2560 N. First St., San Jose. Call: Mona Kellem, (408)534-1255. [Exp. #101.]

North Bay Systems Professionals. Meetings: 3rd Wed., 7:00 pm, Holiday Inn, Terra Linda, 1010 Northgate Dr., San Rafael. NBSP provides a forum and network for systems professionals. Call: Harry Chapman, (415)291-0174. [Exp. #101.]

Robotics Society Of America. Meetings: 2nd Mon., 8:00 pm, Exploratorium Library, San Francisco. Call: Brad Smallridge, (415)550-0588. [Exp. #101.]

Society For Technical Communication, Berkeley Chapter. Meetings: 2nd Wed., 6:00 pm, Yenching Restaurant, 2017 Shattuck Ave., Berkeley. Call: Rich Julius, (415)837-0397. [Exp #102.]

Society For Technical Communication, San Francisco Chapter. Meetings: 3rd Wed. Call: (415)985-7121. [Exp. #103.]

Software Entrepreneurs' Forum. 3rd Wed., 6:30 pm, Elk's Lodge, 4249 El Camono, Palo Alto. Industry association dedicated to software developers and entrepreneurs, offering information and education on all facets of the software industry. Call: Information, (415)854-7219; reservations, (415)965-9003. [Exp. #106.]

United Sysops Association. Meetings: 2nd Wed., 7:00 pm, Coco's, 1035 S. Mary Ave., Sunnyvale. Organization of bulletin board sysops and users. Call: Bill Strouse, (408)739-9081. BBS: (408)739-8753. [Exp. #105.]

USER GROUPS

ACCOUNTMATE

AccountMate User Group. Meetings: 3rd Tues., 7:00 pm, S. Branch Berkeley Library, 1901 Russell St. Call: Joshua, 1-800-310-0262. [Exp. #104.]

ACCOUNTING SOFTWARE

Computer Associates User Group. Meetings: 1st month of quarter on 3rd Wednesdays. Holiday Inn, 1500 Van Ness. Come share ideas and information with other local users of Computer Associates Accounting Software! Call: Beth E. Markus, (415)864-6770. [Exp. #101.]

AMIGA

3rd Dimension—Imagine/Lightwave User Group. Meetings: 1st & 3rd Mon., Computer Showcase, 2739 Geary Blvd., SF. Call: Ollie, (415)863-8792. [Exp. #102.]

AAA—Amiga Addicts Anonymous. Meetings: 3rd Tues., Concord Water District Bldg., 1311 Concord Ave. Classes, BBS, pub. dom. disks, info line. Call: (510)935-0829. [Exp. #106.]

ACCESS—Amiga & Commodore Computer Enthusiasts Society. Meetings: 2nd Thurs., 7:00 pm, Livermore Airport Terminal. Call: Paul, (510)829-6053. [Exp. #102.]

ALF—Amiga Learners Forum. Meetings: 3rd Sun., 6:00 pm, Cupertino Library. Beginners group. Call: (408)262-9334. [Exp. #101.]

Amiga User Group—Germany. German Amiga user group is seeking contacts in the US. Contact: Nils Wietelmann, Unter den Heestern 28, W-2839 Kirchdorf, Germany. [Exp. #102.]

AUM—Amiga Users Of Marin. Meetings: 3rd Wed., 7:30 pm, College of Marin Science Center, Rm. 190. Beginners class at 6:00 pm. Call: (415)456-1411. BBS: (415)485-5895. [Exp. #105.]

AWEST Amiga Users. Meetings: 1st Thurs., 7:00 pm, Laguna Honda School, Conference Rm., 1350 7th Ave., San Francisco. Call: (415)584-8406. [Exp. #106.]

FAUG—First Amiga User Group. Meetings: 1st Tues., 7:30 pm, HT Electronics, 275 N. Matilda Ave., Sunnyvale. Q &A, new product demos, public domain software. Call: Mike Fisher, (415)855-9426; BBS: (415)595-2479; Usenet: mike@hpspd.hp.com. [Exp. #106.]

Redwood Empire Amiga. Meetings: 3rd Tues., 7:30 pm, Santa Rosa Plaza, Community Room. SIGs meet throughout month. Call: (707)523-9978. BBS: (707)795-2717. [Exp. #104.]

TOGA—The Other Group Of Amigoids. Meetings: Varying Sat., 12:30 pm, Milpitas Library, 40 N. Milpitas Blvd. Call: Lawrence Brown, (408)984-6036. [Exp. #104.]

APPLE

Tri-Valley Apple II User Group. Meetings: 1st Wed., 7:00 pm, Glendale Federal Bank, 3101 Crow Canyon Place, San Ramon. Come and learn more about your computer. Support II+, IIc, IIe, IIgs. Call: (510)828-0959. [Exp. #105.]

AT&T

AT&T Computer User Group, North Bay. Meetings: 1st Wed., general discussion at 6:00 pm, meeting begins at 7:00 pm, San Francisco AT&T Bldg., 50 Fremont St. MS-DOS and UNIX. Call: Jim Lansing, (415)885-6631 or Joe Mahoney, (415)584-6510; BBS (415)829-6027. [Exp. #106.]

AT&T Computer User Group, South Bay. Meetings: 3rd Wed., general discussion at 6:30 pm, meeting begins at 7:00 pm, location varies. MS-DOS. Call:

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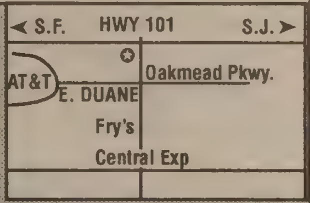

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USER GROUPS

Barbara Kievlan, (408)371-0215. [Exp. #106.]

AT&T UNIX Computer User Group, South Bay. Meetings: 4th Wed., program begins at 7:00 pm, location varies. Call: Thad Floryan, (408)985-7100; USENET, thad@cup.portal.com. [Exp. #106.]

ATARI

ABACUS (Atari Bay Area Users Society). Meetings: 1st Sat. San Francisco. Call: (415)469-7924. [Exp. #102.]

BAAUG (Bay Area Atari Users Group). Meetings: 1st Mon., 7:00 pm, Agnews Aud., Santa Clara. Call: Andres Barbiero, (408)9803-9787. BBS: (408)986-0215. [Exp. #105.]

BASIC

SF Bay Area Visual BASIC User Group. Call: Gustavo Eydelteyn, (510)547-7295. [Exp. #104.]

CAD/CAM

SF Bay Area AutoCAD/DCA Software User Group. Meetings: 3rd Wed., 6:30 pm. All CAD users welcome. Call: Michael Foley, (510)734-0707. [Exp. #103.]

COMMODORE

ACCESS—Amiga & Commodore Computer Enthusiasts Society. Meetings: 2nd Thurs., 7:00 pm, Livermore Airport Terminal. Call: Paul, (510)829-6053. [Exp. #102.]

CAVE—Commodore Amiga Video Enthusiasts. Meetings: Every other Sat., 8:00 pm, 304 Springs St., Old Suisun. Call: Ron, (707)421-2283. [Exp. #101.]

Commodore Hayward User Group. Meetings: 2nd Sat., 2:00 pm, Palma Ceia Park. (510)793-2514. [Exp. #101.]

CONTACT MANAGEMENT

Bay Area TeleMagic User Group. Meetings: 2nd Wed., 4:00 pm. Call: George Workman, (408)476-6385. [Exp. #106.]

CP/M

San Francisco Computer Society. Meetings: 7:00 pm, Laguna Honda School, 1350 7th Ave., San Francisco. Call: Ralph Gallegher, (415)929-0252. [Exp. #101.]

dBASE

ADD dBASE Software SIG. Meetings: 3rd Tues, 7:30 pm, Fort Mason Center, San Francisco. Led by Miriam Liskin. Call: JoAnn, (415)863-6706. [Exp. #101.]

ADD Fox Software SIG. Meetings: 1st Thurs., 7:00 pm, Fort Mason Center, San Francisco. Call: JoAnn, (415)863-6706. [Exp. #101.]

East Bay Database User Group. Meetings: 3rd Sun., 1:30 pm, 2415 Grant St., Berkeley. Call: David Chilcott, (510)653-1303. [Exp. #101.]

DESKTOP PUBLISHING

Bay Area Desktop Publishing User Group. Meetings 1st Wed., 7:00 pm, Nisha Software, 2493 Telegraph Ave., Berkeley. Topics include editing and publishing as a career. Call: (510)848-8200. [Exp. #103.]

Golden Gate Computer Society DTP SIG. Meetings: 3rd Thurs., 7:00 pm, Conference Room, Bay Area Training facilities, 4340 Redwood Highway, Suite 138-F, San Rafael. Call: (415)485-1871. [Exp. #105.]

San Mateo County Ventura Publisher User Group. Meetings: 3rd Mon., 6:45 pm, San Mateo ROP, 1800 Rollins Rd., Rm. 14, Burlingame. Call: Elinor Cruze, (415)366-5317. [Exp. #106.]

FREEDOM, PRIVACY, AND TECHNOLOGY

BMUG SIG On Freedom, Privacy, And Technology. Meetings: Last Sun., 2:00 pm, BMUG office, 2055 Center St., Berkeley. Call: Judi Clark, (510)549-2684. [Exp. #104.]

IBM AND COMPATIBLES

Alameda Computer User Group. Meetings: 2nd Wed., 7:30 pm, Social Hall, Temple Israel, Island Dr. and Mecartney Rd. Providing an informal forum for both Macintosh and PC users to explore questions about hardware and software. Call: (510)523-1139. [Exp. #106.]

Berkeley PC User Group. Meetings: 2nd Mon., 7:00 pm, Winners Circle Systems, 2618 Telegraph Ave., Berkeley. Presentations followed by discussion, PD library, newsletter, Geo Ensemble SIG. Call: Mel Mann, (510)526-4033. [Exp. #101.]

Delta PC Users Group. Meetings: 3rd Sat., 10:00 am. Call: (510)427-2255, ext. 744. [Exp. #101.]

DVPC—Diablo Valley User Group. Meetings: 1st Thurs., 7:30 pm. SIGs include WordPerfect, Windows, Paradox, Beginner's, Visual Basic, education/entertainment, and new users. Call: (510)943-1367. [Exp. #105.]

EastBay FOG. Meetings: 2nd Wed., 7:30 pm, episcopal Church of St. John-in-Montclair, 1707 Gouldin Rd., Montclair. All microcomputers, MS-DOS, CP/M. Call: (510)653-2627. [Exp. #105.]

Golden Gate Computer Society (GGCS). Meetings: 4th Mon. 6:45 pm, San Rafael Community Center. Free intro to computers class at 6:00 pm. Call: (415)927-2909. [Exp. #106.]

IBM Technical SIG. Meetings: 2nd Thurs., 7:00 pm, Cubberley Community Center, 4000 Middlefield Rd., Rm. H-1, Palo Alto. Sponsored by Software Entrepreneurs' Forum. Call:Peter Harris, (415)329-1880. [Exp. #106.]

Micromate–CP/M–DOS Users Group. Meetings: 1st Thurs., 7:30 pm, Eclectic computer buffs. Chabot Observatory, 4917 Mountain Blvd., Oakland. Call: Ed Miller, (510)376-1611. [Exp. #105.]

PC BasicS: Silicon Valley Computer Society SIG. Meetings: 3rd Mon., 7:30 pm, 847 W. Maude Ave., Sunnyvale. Talks presented by Rich Wingerter of Zip Consulting & Design. Call: (415)326-2435. [Exp. #101.]

Peninsula Computer Club. Meetings: 2nd Thurs., 7:30 pm, Social Room, 222 Laurel St., San Carlos. DOS and CP/M libraries. Call: Larry Welling, (415)593-9981. BBS (415)571-9259. [Exp. #104.]

San Francisco Business Computers. Meetings: 4th Tues., 5:30 pm. For those who use computers in business. Visitors $5. Call: (415)788-5338. [Exp. #106.]

San Francisco PC Users Group. Meetings: 3rd Tues., 6:15 pm, Conference Center, Bldg. A, Fort Mason. Call: (415)979-5879. [Exp. #105.]

South Bay WordPerfect User Group. Meetings: Dates vary, Saratoga Community Libraty. Free. Call: Martin Van Derpool, (408)238-8434. [Exp. #106.]

Stanford/Palo Alto PC User Group. Meetings: Last Wed., Turing Aud., Stanford. DOS/Windows. Call: (415)329-8252. [Exp. #103.]

KNOWLEDGEMAN

Bay Area KnowledgeMan (And Guru) User Group. Meetings: 1st Tues., 6:30 pm., JNZ, Inc., 826 Las Trampas Rd., Lafayette. A forum for discussion and info concerning mdbs products, esp. KnowledgeMan and Guru. Call: (510)947-4878. [Exp. #101.]

LAPTOPS

HPX HP Laptops & Handhelds. Meetings: 2nd Sat., 10:30 am, Sunnyvale. Call: Michael Felsenstein, (415)564-8279. [Exp. #102.]

LEGAL

SF Bar Assoc. WordPerfect User Group. Meetings: 3rd Wed., noon, Brown bag meetings. SF Bar Assoc. Boardroom, 7th Fl., 685 Market St. Call: (415)421-5650. [Exp. #106.]

MACINTOSH

A32 Macintosh User Group. Meetings: 2nd Sat., 10:00 am, GTE Bldg 3 Cafeteria, 100 Ferguson Dr., Mountain View. Call: (408)263-0398. [Exp. #106.]

BMUG—Berkeley Macintosh User Group. Meetings: Every Thurs., 6:00 pm, Physical Sciences Lecture Hall, UC Berkeley Campus. Call: (510)549-BMUG. [Exp. #101.]

BMUG West. Meetings: Last Mon., 6:30 pm, San Francisco Exploratorium. Call: (510)549-BMUG. [Exp. #101.]

International Macintosh Users Group (IMUG). Meetings: 3rd Thurs., 6:45 pm, location varies. A forum for multilingual computing. Call: Roger Sherman, (415)859-5146. [Exp. #105.]

Let's Go Macintosh Computer Society. Meetings: 3rd Thurs., 7:00 pm, Skyline Jr. College, Media Center, Rm. 2105, San Bruno. See and try interesting new products, meet other Mac users, hear guest speakers. Call: Fidel Cajulao, (415)221-2995, or Nolan Apostle, (510)947-2523. [Exp. #103.]

Macintosh SIG. Meetings: 3rd Tues., 7:00 pm, Apple Cafeteria, City Center 4, De Anza and Rodrigues, Cupertino. Sponsored by Software Entrepreneurs' Forum. Call: Jeff Cherniss, (408)999-2524. [Exp. #104.]

Macintosh SIG Of Programming And Interfacing Enthusiasts. Meetings: 2nd Thurs., Lynbrook High School, Rm. 33. Call: George Ingalls, (408)243-0234. Write: PO Box 2185, Santa Clara, CA 95055. [Exp. #105.]

Macs Of Marin. Meetings: 2nd Thurs., 7:00 pm, Redwood High School, Larkspur. Marin County Mac User Group for all levels of expertise, beginners welcome, SIGs. [Exp. #102.]

SPC Apple User Group. Meetings: 2nd Wed., 7:30 pm, Fremont Main Public Library. The Society for Prevention of Cruelty to Apple Computers Users Group supports all Apple and Macintosh computers. Call: Jim Weil, (415)796-7169. [Exp. #105.]

MULTIMEDIA

BMUG Multimedia SIG. Meetings: 2nd Mon., 6:00 pm, Call: (510)549-BMUG. [Exp. #106.]

International Interactive Communications Society—IICS. Meetings: 2nd Tues., 7:00 pm, alternate locations San Francisco and south bay. For people involved or interested in developing and using interactive multimedia technologies. Call: IICS Hotline, (415)328-7318. [Exp. #106.]

Macromedia User Forum. Meetings: 1st Wed., 600 Townsend, at 7th St., San Francisco. Meet fellow professionals, preview products, get questions answered. Call: John Dowdell, (415)665-3916 (days); Email: jdowdell@aol.com. [Exp. #106.]

Multimedia SIG. Meetings: 1st

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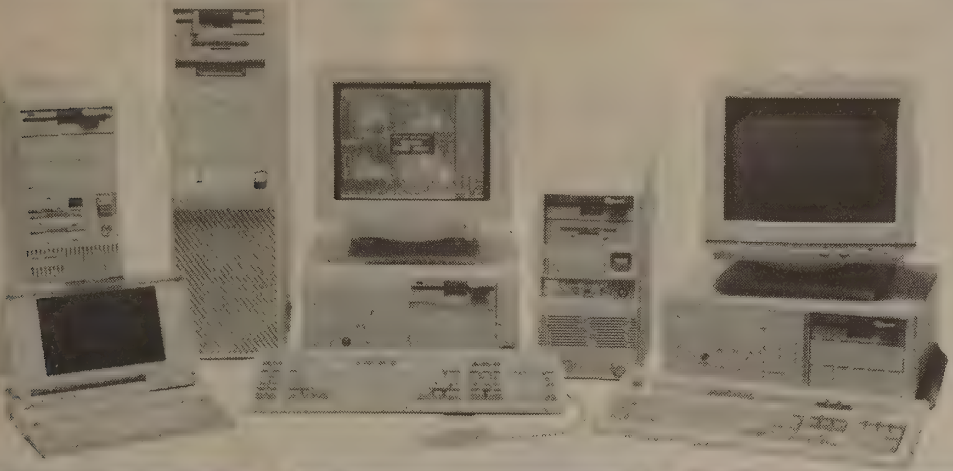

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Thurs., 7:00 pm, Cubberley Community Center, 4000 Middlefield Rd., Palo Alto, Rm. H-1. SIG of Software Entrepreneurs' Forum. Call: Valerie Taylor, (415)424-9051. [Exp. #104.]

Multimedia User Group. Meetings: 1st Wed., 7:00 pm, 600 Townsend St., 1st Fl., San Francisco. A forum to learn about the multimedia industry, get your questions answered, and meet with fellow professionals. Sponsored in part by Proxima and Mitsubishi. [Exp. #102.]

NETWORKING

NetSIG. Meetings: 4th Tues., 7:00 pm, Novell Sunnyvale. Networking SIG for Software Developers. SEF group. Call: Skip Addison, (408)277-5867. [Exp. #105.]

NEXT

BANG—Bay Area NeXT Group. Meetings: 3rd Wed., 7:00 pm, Terman Aud., Stanford. Presentations and lectures. Call: (415)327-BANG. Email: info@BANG.org. [Exp. #102.]

Berkeley NeXT Users Group. Meetings: 2nd Tues., 7:00 pm, 2055 Center St., Berkeley. Call: Bernt Wahl, (510)644-0139. [Exp. #101.]

NOVELL

Silicon Valley Novell User Group. Meetings: 3rd Wed., 6:30 pm, Coco's, 1305 S. Mary Ave., Sunnyvale. Call: Bill Strouse, (408)739-9081. BBS: (408)739-8753. [Exp. #106.]

OMNIS 7

GUIdata Bay Area Omnis 7 User Group. Meetings: 1st Mon. Newsletter, forum for all users. Call: Peter Bennett, (510)935-5203. [Exp. #101.]

OS/2

OS/2 Bay Area User Group. Meetings: 4th Mon., 7:00 pm. For anyone interested in OS/2. Presentations, product demos, questions and answers. Call: (415)755-3124. [Exp. #106.]

OS/2 SIG Of San Francisco. Meetings: 2nd Wed., 7:00 pm, location varies. Call: Margery Blum, (415)931-3110. [Exp. #106.]

PEN COMPUTING

Pen Systems SIG. Meetings: 4th Wed., 7:00 pm, Cubberley Community Center, Rm. H-1, 400 Middlefield Rd., Palo Alto. SIG of Software Entrepreneurs' Forum. Addresses all issues of interest for developers of pen computing software. Call: Bill McApline, (415)348-2257 or SEF at (415)854-7219. [Exp. #101.]

PROJECT MANAGEMENT

Microsoft Project User Group. Meetings: 3rd Mon., 6:30 pm, TEK/LINK Corp., 2901 Tasman Dr., Suite 207, Santa Clara. Project management solutions with Microsoft Project software—both PC and Mac. Call: Henry Viveiros, (408)293-5201. [Exp. #101.]

Q&A

East Bay Q&A User Group. Meetings: 4th Tues., 7:00 pm, San Leandro. Developing and expanding the many uses of Q&A database/word processor program by Symantec. Call: Philip Edwards, (510)635-1997. [Exp. #106.]

West Bay Q&A User Group. Meetings: 2nd Tues., 7:00 pm, Redwood City. Developing and expanding the many uses of Q&A database/word processor program by Symantec. Call: Philip Edwards, (510)635-1997. [Exp. #106.]

SQL

SQL_Forum/Bay Area SQL Database Server User Group. Meetings: Once a month in downtown SF. Oracle, SQL Server, SQLBase, and more. Call: Robert Gentry, DBBS, Inc. (415)583-3000. [Exp. #102.]

TELECOMMUNICATIONS

BMUG Telecom SIG. Meetings: Last Wed., 8:00 pm. How to use your modem, terminal programs, and the BMUG BBS. Call: (510)549-BMUG. [Exp. #101.]

SDL Interest Group. Meetings: 1st Thurs., 5:00 pm, Anonymin, 50 University Ave., Los Gatos. To discuss and exchange ideas on SDL, the CCITT z.100 standard for telecommunications description and design. Call: Malou Zanni, (408)399-5030. [Exp. #103.]

TEXAS INSTRUMENTS

Santa Clara Valley TIPC Group. Meetings: 4th Thurs., 7:00 pm, Magnolia Inn, 176 S. Bernardo, Sunnyvale. Newsletter, library. Call: Ralph, (510)526-2492. [Exp. #106.]

TI-99/4A. Meetings: 2nd Sat., Oakland. Call: Fred, (510)530-8335. [Exp. #102.]

THEOS

Theos User Group. Call: (510)785-7355. [Exp. #106.]

UNIX/XENIX

N. Cal UNIX Users. UNIX user group now forming: AT&T UNIX, Coherent, SCO UNIX/XENIX, and LINUX. Write: Just Computers, PO Box 355, Cotati, CA 94931. [Exp. #105.]

UNIX SIG. Meetings: 2nd Tues., DEC, 800 W. El Camino Real, Mountain View. Sponsored by Software Entrepreneurs' Forum. Call: Priscilla Rowe, (415)776-0513. [Exp. #106.]

VIDEO TOASTER

Video Toaster User Group. Meetings: Last Thurs., 7:00 pm, HT Electronics, 275 N. Mathilda Ave., Sunnyvale. Special guests, equipment demos, hands-on workshops, plus info/tips on new System 2.0. $4 for non-members. Call: Andrew Timmins, (408)243-9233 (eve). [Exp. #104.]

WINDOWS

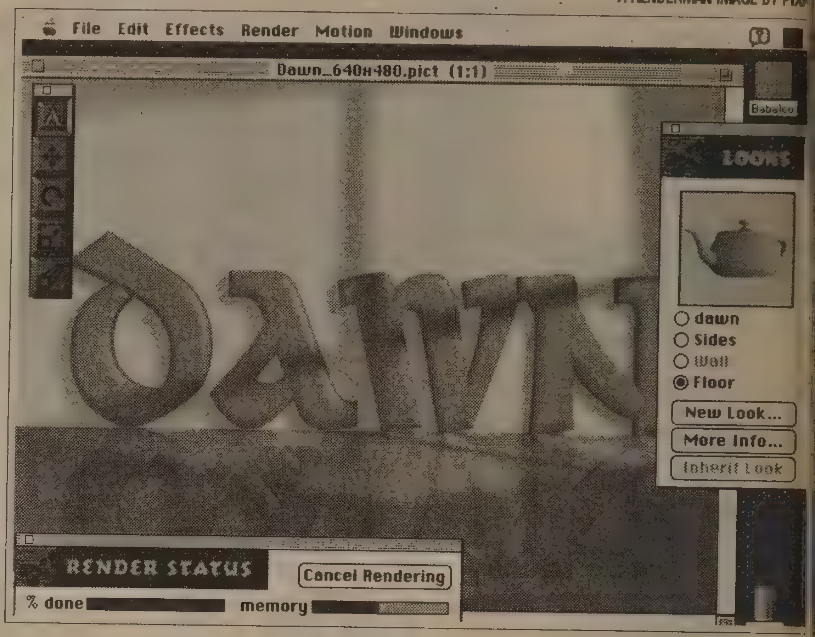
BMUG Windows Programmers SIG. Meetings: 1st Tues., 6:30 pm, 2055 Center St., Berkeley. The Programmers SIG is a forum for Windows programmers of all levels to meet and exchange information. Call: Ferdinand Rios, (510)526-3031. [Exp. #106.]

WinSIG. Meetings: 1st Wed., 6:30 pm, Cubberley Community Center, Rm. H-1, 4000 Middlefield Rd., Palo Alto. Windows SIG of the Software Entrepreneurs' Forum. Call: Fran Finnegan, (415)288-4400. [Exp. #105.]

TELL 'EM YOU SAW IT IN MICROTIMES

Continued from page 238

A RENDERMAN IMAGE BY PIX



Typestry

Pixar's latest release in the RenderMan family of products is Typestry ($299), an application that turns Type 1 and TrueType fonts into 3-D images. It uses an even simpler interface than ShowPlace, and offers special effects like motion blur, perforations, bevels, and QuickTime animations.

Typestry was designed for creating 3-D effects in a 2-D environment. It's perfect for creating type effects for use in page layout programs, package design, and multimedia presentations. Images from Typestry can be rendered at any resolution, and can be exported smoothly to Photoshop using an alpha channel to prevent jaggies.

Typestry has that wonderful mix of a short learning curve for the basic features, and lots of subtlety and depth in the background for those wishing to become power users. Two pages in the manual are all it takes to take you through installation and the creation of your first image. The manual is laid out more like a magazine than the traditional tutorial-and-reference style. This has both benefits and hazards. The liberal use of illustrations and sample renderings, the hints and tips mixed in with basic instructions, and the honest discourse on rendering times all help to draw you deeper. The lack of any reference section and the minimal index may leave you with no option but to call for technical support (fortunately an 800 number).

While not designed as an animation program, Typestry does provide some powerful animation features. The keyframe editing capability, the hierarchical relationships of objects, the variety of preview modes, the motion blur, and QuickTime support all tantalize and inspire one to find ways to push Typestry just a little further. With the right set of Type 1 fonts you may be able to do more than the designers of Typestry expected.

—*Matthew Leeds*

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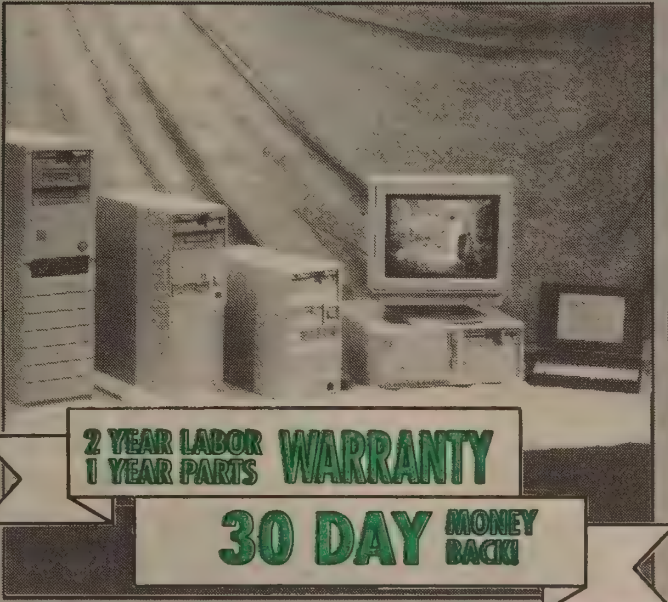

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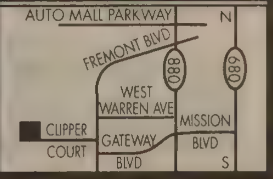

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Continued from page 28

lets you control Windows through voice commands if you are lucky. It is fairly unrefined, and most reviewers have found that the software is quirky at best, certainly not something that you would want to trust your data to.

Other software included with the system converts sounds from other formats (such as from the Macintosh, NeXT, and MIDI files), plays audio CDs, and assigns sounds to system events. The latter may seem trivial, but it has been by far the most used sound tools on the Macintosh.

If this strategy is successful, Microsoft will force its competitors to drop their prices and include software as well. Although this will initially be painful for many companies, Microsoft is betting that the lower price will cause a groundswell of interest in sound for business users. The ideas of using voice annotation and good sound for presentations has been around for a while: Apple introduced them years ago on the Macintosh. Given the total lack of success that Apple had in convincing people to use voice annotations (even in Microsoft's Word program), Microsoft will face an uphill battle to get PC users to use them.

The prospect of voice control is much more exciting, but also more elusive. The amount of processing it takes for a computer to both recognize commands and distinguish them from other similar-sounding commands is huge, much larger than what is available on most PCs that are also running application software. The reliability and sensitivity of the recognition software has to be so good that users will inherently trust it. The first time you say "cut" and the system thinks you said "quit," you will lose faith, particularly if you lose some of your work. Voice Pilot is by no means the best that can be done, but it will be the first exposure that many PC users have to voice recognition. Its unreliability may cause novice users to assume that voice control will never work. ■

Technology News From Japan

(Excerpted from the weekly news digest of Japan Marketing Group, 400 Groveland Ave., Suite 312, Minneapolis, MN 55403, 612/871-7889. JMG covers products and events in the Japanese computer industry.)

- **Ricoh** has developed an electronic still camera capable of recording motion pictures and sounds as well as still images. The company has no immediate plans to market the product, which uses a proprietary chip that combines image compression and memory interface circuits. The camera uses IC cards as a recording medium; a 2Mb card can record 40 still pictures and 400 seconds of sound; an 8Mb version can record TV-quality pictures for five seconds.
- **Autodesk (Japan)** shipped versions of AutoCAD Release 12J for NEC, Seiko-Epson, and IBM PCs on September 25, and plans to ship workstation versions in mid-October. The Sausalito company's Japanese subsidiary, which currently has a 32% share of the PC CAD market in Japan, plans to raise that to 50% within two years.
- With the expiration of its distribution contract with **Canon**, by which Canon had an exclusive license to sell its Mac software in Japan, **Microsoft** has responded to requests from retailers and users unhappy with Canon's limited channels by undertaking direct sales and support of its own software in September. The Macintosh software market is growing rapidly, and Microsoft hopes to triple its Mac software sales in 1993 over the estimated 700-800 million yen in fiscal 1992.
- Suggesting that the US price war in the PC market may be moving overseas, **AST Research** has announced price cuts averaging 14% on its mainstay PC models in the Japanese market, including the DOS/V version of the PC Vision, the English-language Premium Exec, and the Premium SE network servers. Other vendors including **Compaq** and **Dell** are reportedly considering similar moves.

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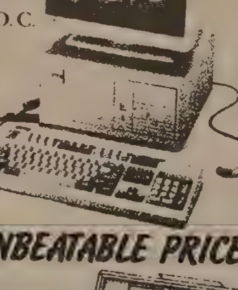

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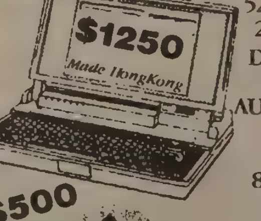

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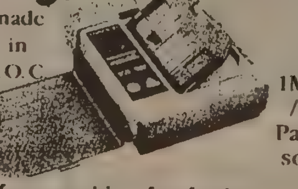

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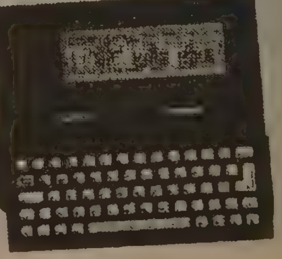

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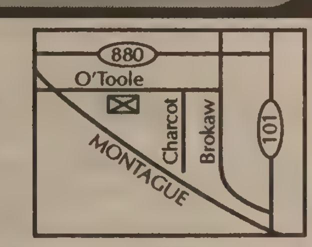

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Industry Group Arguments Against The Bill

no question that, as drafted, it would have an extremely broad reach. As a result, it could complicate the development of various new technologies. Even though the language of the proposal would extend to cable information systems and Automated Teller Machines ("ATM"), the FBI has stressed in its proposal that various systems might be exempted by executive action. But the exemption authority is vague and standardless—so the net effect is that every system provider has to worry on a continuing basis about whether or not its system is covered. Moreover, the proposal is clearly designed to cover any system facilitating two-way conversation, regardless of the size of the communications service provider. In consequence, any small business that installs its own local PBX system for forwarding calls from customers could be required to replace its equipment with new switches that meet the law's requirements. If current online information services do not track the "services" and "features" used by those who send messages through their electronic mail channels, then expensive modifications might be mandated. Because these electronic mail systems are all being joined together, and some function as links that forward messages between other systems, all might have to be designed to allow "real time" interception by retransmission to a remote site—even though delayed searches of stored files would seem to make a lot more sense in the context of electronic mail.

INDUSTRY: "Although the FBI has characterized its proposed 'Digital Telephony' legislation as relating to the preservation of government's ability to engage in authorized wiretapping, the proposal actually requires that all communications and computer systems be designed to facilitate interception of private messages, on a concurrent and remote basis—thus imposing new engineering standards that go far beyond any existing law."

Costs Likely to be Imposed by the Proposal. The costs imposed by this proposal would be passed on to consumers and to all subscribers to electronic communications services. The total costs, including costs imposed by its potentially disruptive impact on planning for new computer and communication technologies, cannot be fully assessed—but would clearly be very substantial. In its report on the FBI's proposal, the General Accounting Office ("GAO"), page 1, stated: "[N]either the FBI nor the telecommunications industry has systematically identified the alternatives, or evaluated their costs, benefits, or feasibility." And further at page 4 of the GAO Report:

> *[T]he [FBI's] May proposal does not address what the telecommunications industry would need to do to be in full compliance with the proposal in the event it is enacted, the meaning of certain technical terms, or who would pay for the cost of wiretapping solutions.*

The proposal mandates compliance with very broadly stated functional standards and contemplates that exemptions (available from the Attorney General, without the benefit of any specific standards or criteria) will be granted only after this broad new governmental authority has been enacted into law. The most recent proposal assumes that the costs of compliance will become a cost of doing business imposed on all communications service providers—and passed on to telephone ratepayers and other subscribers to electronic communications services. (The current law's provision that the government will pay reasonable expenses incurred in cooperating with a specific request for interception have not been expressly applied to this new requirement to "provide the capability and capacity" to respond to such requests.) Communication service providers and computer equipment manufacturers could suffer major losses as a result of delays, mandatory redesigns, and even prohibition of certain technological options. There has been no opportunity as yet to compare (1) the costs the FBI would incur to modernize its approach to interception (especially given the data on the small number of taps performed annually) with (2) the costs that would be incurred by consumers as a result of mandatory limitations on new technology design applied to all technologies nationwide.

Uncertainties Created by the Proposal. By attempting to establish open-ended duties, broadly defined, in statutory language, the current proposal creates substantial uncertainties and could cause controversy to supplant cooperation. For example, although current interception orders predominantly relate to voice communications, the draft proposal covers all forms of communication. This approach could sweep up systems ranging from the cellular pager to the high-speed network designed to transfer digital data between supercomputers. It raises a wide variety of questions:

- What exactly are the boundaries of the "public switched network" to which the proposal refers?
- On what basis would the Attorney General choose, or be required, to provide exemptions?
- How would the proposal affect systems that regularly encode messages at the point of origin?
- Does the required provision of capacity to intercept "concurrent with the transmission to the recipient" mean that an electronic mail or voice mail or facsimile mail system must be designed to signal the system operator every time a message from a target of an investigation is accessed by the person to whom that message might have been addressed?
- Will it be technically feasible to detect and separate just those parts of a communication signal coming from a particular residence or other source, that "exclusively" represent the content coming from a particular individual?
- What is meant by the new, broad requirement that the government be told what "services, systems, and features" have been used by the subject of the interception?
- Does the required provision of interception capacity "notwithstanding ... the use by the subject ... of any features of the ... system" have the effect of requiring the system provider to offer to defeat any encryption mechanism it may provide to subscribers?
- Does the requirement to provide interception despite the target's mobility mean that systems that inherently allow users to send and receive from multiple points, without notice, cannot be used at all?
- Will it be physically possible or economically feasible to prevent "degradation of services" if the functional requirement for real time tracking of any target means that some central database must be checked by the service provider's computers every time a communication is made?

We don't know the answers to these questions, despite their importance. More importantly, the answers to key policy questions

Continued on page 280

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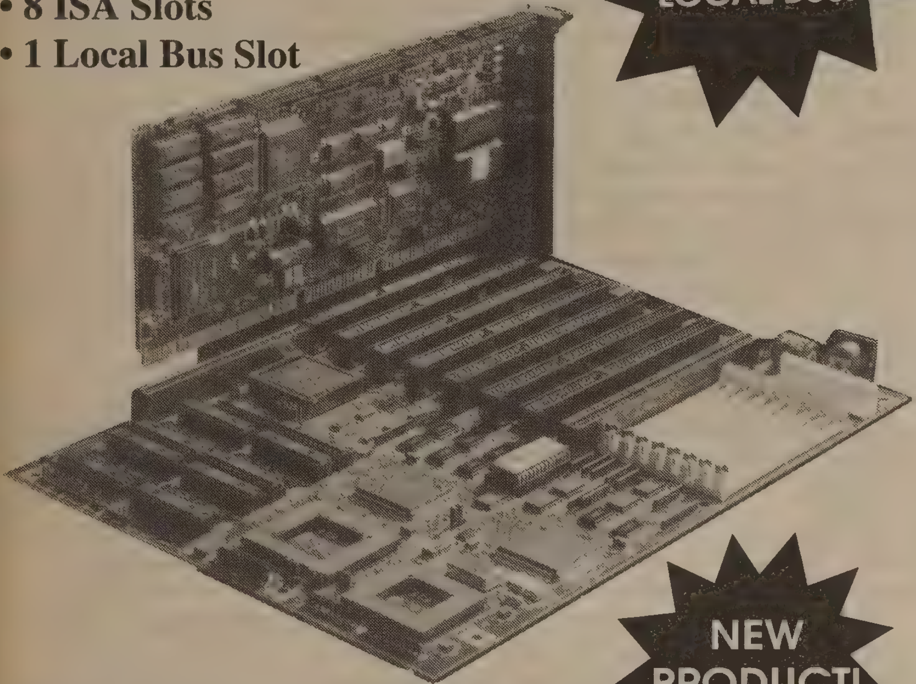

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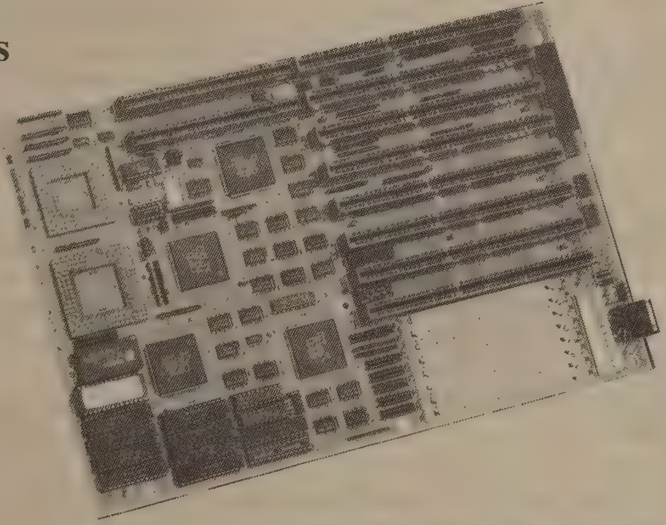

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Continued from page 278

Industry Group Arguments Against The Bill

may differ substantially depending on what particular technology and interception need (and minimization goal) is being addressed. And we don't even know by what means providers of electronic communications services and designers and users of electronic communications and computing equipment will find out how the requirements will be applied to their systems. In short, the FBI's proposal, as currently drafted, may generate new and unnecessary controversy, despite its legitimate goals, by attacking perceived problems at the wrong level of generality.

Threat to security and privacy. Ironically, in addition to creating uncertainty and imposing costs, the proposal would itself create new and serious security risks and undermine the privacy of electronic communications. If electronic communications service providers must design their systems to allow and ensure FBI access, then the resulting mandatory "back doors" may become known to and be exploited by criminals. Business is currently attempting to achieve greater security in its communications, to counter the threats posed by unauthorized access, computer viruses, and electronic theft. A proposal the FBI seeks to justify in terms of law enforcement could well have the effect of facilitating violations of law and reducing or preventing effective security measures.

Threat to International Trade and Security Interests. As drafted, the proposal appears to threaten US interests in international trade and competitiveness. Potential purchasers abroad may not buy products or systems that they know have a "trap door" the United States Government can easily open. If US manufacturers of communications systems and equipment and computer software have to go through a bureaucratic certification or clearance process that is not applicable to their foreign competitors, their race to the market with new technologies will be slowed and their products and designs will be disadvantaged.

Legitimate Law Enforcement Interests and Concerns Can and Should be Served. There is no doubt that authorized wiretapping is an important weapon properly used by the FBI to fight serious crime. And there is general agreement among communications service providers, and the makers of communications and computing equipment, that the FBI is entitled to full cooperation in its efforts to exercise the powers granted to it in the wiretap statute. If new technologies require changes in police tactics, then accommodations may be needed on all sides to make sure that new tactics that do not threaten the effectiveness or safety of law enforcement (or unreasonably threaten privacy interests) are available. The FBI proposal has served a valuable purpose in drawing attention to the need for adequate planning and redoubled cooperative efforts.

It is Too Soon to Tell Whether Legislation will be Necessary. Despite the good intentions underlying the FBI proposal, there is certainly no demonstrated need to hamper US technological advances, harm the competitiveness of the US communications or computer industries, or hinder efforts by business to increase computer security, just to make sure that law enforcement officials can continue indefinitely to use the same equipment and procedures that were appropriate for an earlier technology. There has as yet been no clear showing that the design of new technologies will not permit reasonable, affordable and effective techniques to be used for authorized interception. There has been no showing that the industry will not or cannot cooperate fully, share technical information under appropriate protections, and even design and supply new equipment at reasonable cost, insofar as these steps prove necessary for the FBI to accomplish its mission. There has been no clear showing that any capacity limitations could not readily be remedied with the provision of adequate financing for government law enforcement operations.

The Current Proposal is Clearly Premature, in Light of Active Ongoing Efforts by Industry to Identify and Solve any Serious Problems. An ad hoc coalition of interested parties has joined together to study the issues posed by the FBI's proposal and to begin discussions involving various business interests, public interest groups, the law enforcement community, legislative staff, and representatives of the Administration. All involved recognize that the FBI is entitled to have adequate tools to fulfill its law enforcement objectives. For its part, the FBI has recognized the value of industry cooperation and the need for a more robust exchange of technical information. Once the technical issues come into focus, particular policy issues may be ripe for decision, in a context in which the costs and implications of such decisions for trade, security and privacy concerns will be much more clear. Technical Working Groups representing both the telephone companies and the computer industry are hard at work—but the issues are complex and even the first stage of identifying serious potential problems for law enforcement will take some time. Consideration of proposed solutions should await the results of these detailed and technical discussions.

CONCLUSION

As the broad collaboration that accompanied consideration of the 1986 amendments to the wiretap statute showed, the public interest in sound law enforcement, and public expectations of privacy and security, are best served by encouraging a constructive exchange of views among industry, concerned citizens and government, before any new legislation is enacted. Congress should reject the FBI proposal and encourage continuing discussions that will lead to more specific identification of any problems and to concrete, cost-effective solutions.

ELECTRONIC FRONTIER FOUNDATION

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Agson, Inc.
American Civil Liberties Union
Arrow
AT&T Cellular Telecommunications Industry Association
Computer and Business Equipment Manufacturers Association
Computer and Communications Industry Association
Computer Professionals for Social Responsibility
Digital Equipment Corporation
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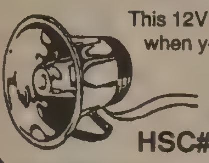
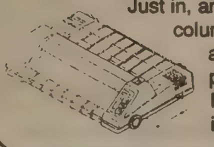
Sound the Alarm! Sirens for Sale!



This 12VDC yelping siren is just what you need for those times when you want to attract a lot of attention! These babies are LOUD! Genuine UNGO siren, new in box. Sorry, no other alarm circuitry available, but our techie customers should have no trouble coming up with their own!

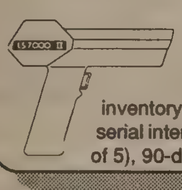
HSC# 13619 $9.95 ea. or 10/$75.00

Printers for Pennies (nearly!)



Just in, and they won't last! Miscellaneous makes of used 80-column printers, in various states of repair. We will test and attach test page or rough diagnostic tag to each one and price accordingly, from $19.95 (dead) to $119.95 (primo). Hurry, as these definitely will not hang around. Brands include Okidata, Citizen, Epson, and Fujistsu.

Bar-Code Scanner Shoots Prices!

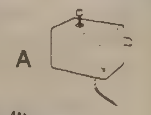


This looks like a fun technology to play with...teach your computer to read from a distance! These Symbol Technology LS7000II Bar-code Scanners are refurbished He-Ne laser scanner/detector units as used in many retail or inventory logging situations. Scan Gun comes with power supply, serial interface box (decodes UPC/EAN, Code 39 and Interleaved 2 of 5), 90-day exchange warranty. **HSC #13632 $225.00**

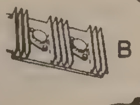
More from HSC's Project Locker...

We've scoured our shelves once again for rare & unusual parts that will get you thinking of the many uses to which they may be put. Many items you just won't find anywhere else, and our prices will encourage you to dream up new projects!

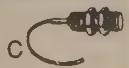
A. Inexpensive Motion Detector consists of a sealed metal box with a spring-mounted weight that closes a contact when jostled. Sensitivity adjustment & two mounting ears complete the package. 2.5" x 2" x 1" **HSC# 11456 $.95 ea.**



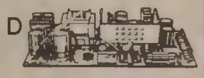
B. Heatsink with complementary Darlington Pair transistors measures 3" x 6.25" x 1", has 2N6031 (NPN) and 2N6058 (PNP) already mounted. 80V, 12A, hFE = 750 to 18000 @ 6A. **HSC#9677 $5.95**



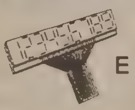
C. Microswitch 103SR11A-1 Proximity Sensor -- Hall-effect detector operates on 5 VDC 4 mA, sources 3.5 VDC max 20mA in presence of greater than 25 Gauss magnetic field. .43" dia. x 1" (nuts not included) With spec. sheet. **HSC #5319 $.99**



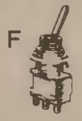
D. Tiny switching power supply, perfect for powering a single 3.5" hard disk drive. 2" x 6.25" x 1.25". Made by Skynet, used, tested good. Selectable 110/220VAC input, 5VDC @ 2A and 12VDC @ 1.5A output. **HSC #12758 $17.50**



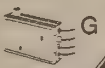
E. Nine-digit, eight decimal point numeric LCD with solderable connection strip. No funny sockets needed! .5" high digits, overall size of display .75" x 3". Pinout included. **HSC #13518 $1.95 ea. or 10/$15.00**



F. Miniature Toggle Switch -- SPDT 125VAC 6A or 250VAC 3A Standard type on-on switch, solder eyelet terminals. Any hobbyist should have at least a handful in his parts bin! Now you can afford it... **HSC# 13630 10/$6.95**

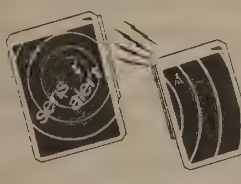


G. Astec UM1285A 2/3 Video Modulator -- input baseband video, get channel 2 or 3 RF out. 1.75" x 3" x .75" **HSC# 5623 $2.95**



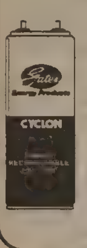
H. Touch Element from Koala Pad -- translate finger position to X-Y coordinates, or replace the element in your Koala pad that was damaged by your child scribbling on it with a ball-point pen! **HSC# 13005 $.95 or 10/$7.50**

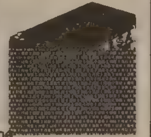
They're back! The Electronic "Leash" and Static "Watchdog"



HSC is once again able to offer you two alarms that protect you in unusual ways...The first is the "Sensor Alert" seen at left. This is a pair of small units that are "tuned" to each other and like to be near one another! When separated by more than 15 to 30 feet, the receiver emits a beeping tone. Think of the uses! Put the transmitter on your small toddler at the shopping center, keep the receiver on your belt (both units have clips). If Junior wanders off...BEEP! Or put one on your car keys, you will never leave the room without them! The possibilities are endless. The receiver is only 2" x 2.75" x .5", and the transmitter is even smaller, only 1.5" x 2.25". Each unit uses three button cells (included). HSC #13024 only $6.95 for the set. The other alarm is our Static Charge Alarm, seen at right, which will alert you to the presence of static electricity fields in its vicinity. This is important to know when working with CMOS or other sensitive integrated circuits. The unit will beep when one of three selectable levels of static charge is detected, allowing you to take preventive action. Only 4" tall, uses a 9VDC 300mA adaptor (included) or a 9V battery (not included). Prevent shocking developments! HSC #12846 only $4.95

Popular Rechargeables, Popular Prices!





These sealed rechargeable lead-acid cells and batteries are always in demand at HSC, so don't wait to order if you want some! The Gates cells were removed from multi-cell packs, so the tabs have been soldered, but they have plenty of life! We even learned that you can "rejuvenate" a flat cell by removing the outer metal sleeve and popping out the rubber plug at the top. Just add some distilled water like a car battery! Some of the 24 VDC multi-cell packs are also available. The Yuasa NP7-12 Batteries seen at right are new out of the crate. They use a gelled electrolyte, so don't try "rejuvenating" these!

Type	Size	Rating	Wt.	HSC#	Each	Pack/12
D Cell	2.65" x 1.33"	2V @ 2.5Ah	.4 lb	12327	$2.50	N/A
X Cell	3.16" x 1.73"	2V @ 5Ah	.8 lb	13513	$3.50	$40.00
J Cell	5.34" x 2.03"	2V @ 12Ah	1.8 lb	13512	$5.50	$60.00
NP7-12	2.5" x 4" x 6"	12V @ 7Ah	6 lb.	13123	$14.95	N/A

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Check out these great items that work on free energy! Go solar & save!

1) **Solar Battery Charger** -- Small unit (2.5" x 4.5" x 1.5") has hinged lid with solar cell array for optimum sun angle. Can charge two AA or C Ni-Cd batteries (not included). LED indicates optimum charge rate. **HSC#80050 $12.95**

2) **Solar Rechargeable Flashlight** -- perfect for camping, emergencies...Never needs batteries! 2.5" x 1.25" x 3" fits in purse, backpack. **HSC#80048 $11.95**

3) **4-Power Radio** -- Good-sounding AM/FM radio has solar panel for daytime use, or its internal dynamo can be cranked to charge internal energy source for up to a half-hour of listening time! Also runs off regular AA batteries or DC Adapter (neither included). Great for emergencies, power outages, camping, etc. 3" x 6" x 1.5" You may never buy batteries again! **HSC#80051 $29.95**

4) **Solar Education Kit** -- includes small solar cell (1.75" x 3" x .25"), booklet, small DC motor, fan blade, spinner disks, stickers, etc. Good for child's school or science fair project. **HSC #80017 $9.95**

5) **Solar Musical Keychain** -- plays melody in bright sunlight, also has LED flashlight so you can find that keyhole in the dark! **HSC # 80053 $4.95**

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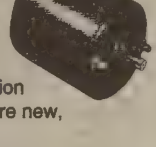
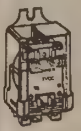
Attention: Robot Builders & Hobbyists!

A. Just in! 12VDC two-speed reversible motors, perfect for your own personal R2-D2's locomotion! These motors are 3" dia. x 4.5" long with a .5" long shaft. They will provide up to 30 oz.-in. of torque at 2700 RPM, unloaded speed is closer to 5000 RPM. Depending on load they draw anywhere from 5 to 9 amps. The .31" (5/16") dia. shaft is cut with gear teeth, but you could still put a pulley or gear with a set-screw on it. Generous 33" long leads are color-coded for easy hook-up. Connection diagram and torque curve chart provided. These motors are new, but slightly dusty. **HSC# 13617 $7.95 ea.**





B. 12VDC SPDT Relay -- just the thing for controlling the above motor (in fact, they are both left-overs from a camper-jack system). C.P. Clare GP3R211ND1000 relay is rated at 10 amps, uses solderless quick-connect tabs, and has handy mounting ears. **HSC# 13618 $4.95 ea.**

C. Heavy duty Coil-cords -- Two types available. Makes connections to moving fixtures easy! Rugged SJO insulation, slightly dusty. These are not easy to find, and only limited quantities are available!

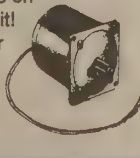
HSC# 13620 20AWG, 5 cond., 5' stretches to 24' **$5.95**

HSC# 13621 18AWG, 4 cond., 4' stretches to 25' **$7.95**

D. Stepper Motors -- Two types, both 12VDC, sorry, no docs on either one yet... we'd appreciate info if you have it!

At left, Howard Ind. Model 1-19-4200, 3.6° per step, 1.75" x 1.75" x 1.75" **HSC #13036 $7.50**

At right, Minebea Co. "Astrosyn" Model 23LM-C331-03, 1.8° per step, 2.25" x 2.25" x 3" with bracket (not shown) **HSC #13594 $4.95**



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Continued from page 72

phone number where they can make contact or at least leave a message. Telecommuters must be trained to check for messages at least twice a day, and more often when a situation demands it. A manager can also eliminate some communications difficulties by making sure everyone comes into the office the same one or two days per week, thus making it easier to schedule meetings where everyone in a particular group ought to attend.

But even if the information required to accomplish their work is transmitted well enough, telecommuters may suffer a productivity letdown for emotional reasons. Many people require frequent contact with co-workers to avoid feeling isolated and depressed. A good manager will identify this problem, too, and encourage the telecommuter to make scheduling adjustments to avoid these feelings. For example, by spending fewer days telecommuting, or by taking lunch with the entire work group on a day when everyone comes in, a lonely telecommuter may begin to feel a part of the work group once again.

Despite fears to the contrary, quite a few telecommuting programs actually result in improved teamwork and productivity. This is usually because the managers involved make special efforts to keep everyone informed and up to speed.

TO MAINTAIN EMPLOYEE LOYALTY TO THE ORGANIZATION

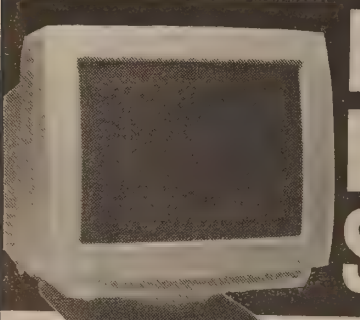
Managers often fear that employees who telecommute will feel less a part of the organization than those who commute to the office every day. But managers who maintain channels of communication, provide mutually agreed upon work goals, and see that telecommuters remain part of the team generally find this not to be a problem. Many successful managers tend to "go to bat" for their telecommuters, keeping them involved in company affairs and making sure that telecommuters are recognized—and rewarded—for their efforts as much as they would be if they worked in the office every day.

But in many cases loyalty takes care of itself, because employees who want to telecommute generally see it as a benefit, and feel more loyalty to a company that allows and encourages this flexible mode of working than they would if the company rigidly prevented them.

TO MINIMIZE THE EXTRA DEMANDS OF SUPERVISING TELECOMMUTERS

There's no doubt that shifting to telecommuting for the first time places an extra burden on managers. They must select and help train each telecommuter, and provide back-up and assistance in overcoming any individual problems—some of which are bound to crop up. They must adjust to the new demands for increased communications, and to fewer impromptu meetings and hallway discussions.

But experience shows that managing telecommuters need not be any more demanding or time-consuming than conventional managerial requirements. Effective managers quickly learn to schedule their time with employees and to stick to this schedule. They learn to pick up the telephone for necessary conversations—which can actually be quicker than walking down the hall to an employee's desk. And they discover that successful telecommuters are happier and more productive than they were in previous days. This alone makes supervising telecommuters easier and more rewarding than most managers anticipate. ■



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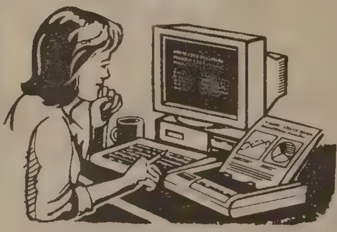

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486-3364K	520	688	934	1064	1110	1220	1280	1400
486SX/20	190	470	694	824	864	920	975	1095
386-40/64K	170	446	678	808	848	900	960	1080
386-33/64K	165	436	668	798	838	890	955	1075
386DX-25	142	402	652	782	822	866	916	1036
386SX-25	103	360	610	740	780	826	876	996
386SX-16	91	350	606	726	776	822	872	992
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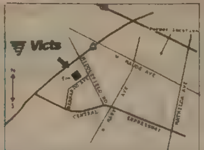

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MICROTIMES

Continued from page 90

ahead of Wyoming. Alaska is two hours behind us and India is in tomorrow! The various branch headquarters' directors can go home at a reasonable hour and still receive reports from other directors or from Wyoming that evening or before breakfast."

Remote Access means that any corporate officer can feel at home in a distant location, because the dependence on a jury-rigged bulletin board system, which may or may not have the files you required on it, is eliminated. Instead, staff personal on the other side of the world have a window on the familiar LAN at the home office. The window is also reliable and performs up to the standard of a high-speed Macintosh server. An appealing solution for companies which have personnel traveling extensively.

Field operators in Mexico and Chile were having difficulty dialing in for data sharing over the home network. Operations Director John Gans, based in Lander, travels frequently to Africa and Latin America on company business, and carries a PowerBook when he does so. Gans now uses Remote Access to dial an 800 number to connect to the LanRover in Wyoming. He uses Microsoft Mail to send and receive messages and documents. On a recent trip to Chile, Gans com-pleted a financial and safety audit on his PowerBook during the return flight from Santiago, Chile, to Miami. Using Remote Access, he forwarded the draft of the document to support staff at the home office, and the document was in final form before Gans arrived home in Lander. The process saved several days' delay in production, as Gans would have had to wait a few days after getting home if the document had been faxed or handwritten.

SECURITY CONCERNS

With growing concern for security from phone fraud or electronic break-ins across remote access networks, how does NOLS manage network security while still retaining convenient access for their distant personnel? LanRover/L's security measures include password security, automatic dial-back, zone access privileges, and view logs of all attempts to dial-up. These measures, taken together, ensure that NOLS has reasonable, effective security while retaining convenience for field operations.

Clark foresees "the day when NOLS teachers, far out on a glacier or deep in the jungle, may be able to access the LAN at the home office via cellular hookup." Of course, battery technology for notebook computers needs to be improved drastically (battery life of two weeks instead of two hours), and no one's figured out how to protect $2000 laptops from the vagaries of Himalaya mountain climbing. Nonetheless, LanRover/L has allowed the Outdoor School to take their system a giant leap outward, to promote a more tightly-knit company organization while limiting costs and retaining their far-flung empire. It appears that LanRover/L, while not necessarily a revolutionary product, is most certainly an evolutionary one, which advances the inexpensive state-of-the-art for remote network managers, and fills a gap sorely felt by many companies. ■

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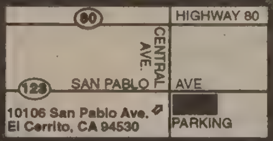

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Continued from page 128

As an example of current work, consider the molecular optical memory research underway by Prof. Robert Birge and his group at Syracuse University. Using the purple membrane from the bacterium *Halobacterium halobium*, they've made a working optical bistable switch, fabricated in a monolayer by self-assembly, that reliably stores data with ten thousand molecules per bit. The molecule switches in 500 femtoseconds—that's 1/2000 of a nanosecond, and the actual speed of the memory is currently limited by how fast you can steer a laser beam to the correct spot on the memory.

Lest you think this is some far-out distant future research topic, here's an ad from a couple weeks ago by a company in West Germany offering bacteriorhodopsin for sale, listing under applications, "Optical data processing, optical switches, holography, information processing, nonlinear optics, and light sensors."

SIXTH INDUSTRIAL REVOLUTION

And so, we can begin to see the outlines of the sixth industrial revolution: moving from micrometer-scale devices to nanometer scale devices. Current progress suggests the revolution may happen within this decade, perhaps starting within five years.

Neither the events nor their consequences will be subtle. Suddenly, we'll acquire new capabilities comparable to those of electronics or computers.

What can we make with it? Well, anything we can design and model that's built of atoms. Think about that. And that includes the essential component of the industrial revolution that will follow, perhaps in the same year.

SEVENTH INDUSTRIAL REVOLUTION

For once we've mastered the essential technology of life, assembling objects at the molecular level with molecular machines, there's no reason we can't rapidly exploit the central trick of life as well: getting the job done with machines that make copies of themselves.

Mass production has reshaped our industries, lives, economies, and societies, but it's been a limited form of mass production: one where the process of production was explicitly designed and rigidly oriented to making a given object.

Once we can build molecular machines, we can design machines that make copies of themselves. By doing so we achieve the second level of mass production: being able to make anything we can design at a cost fundamentally constrained only by the materials and information it contains.

If this seems absurd, just imagine how an engineer at the start of the twentieth century would have reacted to a description of photolithography, the technology we now use to make integrated circuits and printed circuit boards. "You're telling me you can manufacture objects in the millions just by making *photographs* of them? Give me a break!"

In fact, if we want to make objects on the meter scale with molecular engineering, we're going to have to design replicating machines. The vacuum tube I showed you has about 10^{23} atoms in it, and if you try to build something that large atom by atom, it's going to take pretty long. If you add an atom every second, it'll take 10^{23} seconds, which is a real problem because that's a million times longer than the current age of the universe. But, if you can get your molecular machines to crank out copies of themselves, you can set up a chain reaction that can generate numbers on that scale quite rapidly. That's how biology manufactures bacteria, butterflies, and buffaloes, and it works very well.

This is flexible manufacturing taken to the logical limit. An invention made on Monday could, by the following Friday, be in mass production, with billions of copies fabricated. It's the ultimate triumph of information over machinery, of software over hardware, of intellect over capital.

The consequences of this are truly hard to grasp. Just as the development of computers made many problems that have vexed mankind for centuries essentially trivial, we're looking here at the first fundamental change in the means of production in the last two million years. Our economic and societal structures have evolved around assumptions that will no longer be valid once technology reaches this milestone. And it may happen in the next ten years.

But the real question I haven't answered yet is this. "Is it actually possible to make these little tiny machines out of atoms and then get them to replicate themselves, or is this all just a pile of hooey, as ridiculous as, say, putting sixteen million transistors on a piece of silicon the size of your fingernail?"

Let's look at how we might design such a machine. Here's a little gadget that looks like a lunar lander, but considerably smaller. It stands about 225 nanometers high. This device is designed to operate within a living system, to seek out cells of a particular type, land on them by extending its landing legs, then inject them with material stored in the tank at the top.

You could design something like this, for example, to locate cancerous cells in a human body and kill them.

Here's our little machine attached to a cell, with its injector poked through the cell membrane and emptying the tank into the cell's interior. For a sense of scale, this entire gadget, standing on its tippy-toes, would be less than a quarter the size of the smallest feature of a current microprocessor integrated circuit.

Could something like this be built? Could it possibly work?

Yes. Here's a scanning electron microscope picture of the actual device. It wasn't designed on a CAD system; it evolved in nature. It's called bacteriophage T4. It's a virus that preys on *E. coli*, a common bacterium that lives in the human intestine.

So molecular devices exist, work, and even succeed in replicating themselves in a proper environment.

Here's an electron micrograph of some *E. coli* cells infected with another virus, phage f2. The crystalline lattice in the corner of the cell is an array of self-assembled copies of the virus, manufactured within the cell.

You might also ask, "Can we store information at the molecular level?" The answer to this is also yes, and each of us is living proof. Here's a picture of a molecular-level file copy operation in progress. This is a 140,000 times blow-up of a strand of messenger RNA being transcribed into the proteins it encodes by a bunch of ribosomes—they're the little beads on the string of RNA. The bumpy strings coming out the sides are the protein chains being assembled by the ribosomes. Each ribosome is a little molecular machine about 20 nanometers across that manufactures proteins to order by reading a tape called messenger RNA and assembling the protein it describes according to the genetic code.

There are quadrillions of them busy at work in each of your bodies at this very moment, and they're about as accurate in copying the molecular data in your DNA as a typical hard disc drive. Since these biological molecular machines obviously exist, and clearly work, and since biology follows the same laws of physics and chemistry we apply as engineers, there's no question our molecular machines will work. All we have to do is figure out how to design and build them.

And with the rapid progress on all fronts toward molecular fabrication, design may become the most important part of the puzzle.

THE ARGUMENT FOR DESIGN

The consequences of any industrial revolution extend far beyond the domain of scientists and technologists. Indeed, they are difficult to

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Precise, atomic-level fabrication has previously been done only by living biological organisms.

even imagine. For example, try to envision the present world without any electronic devices. You can't. Nobody can. It would be a very different world from ours.

Similarly, the world that will develop after the next two industrial revolutions is difficult to imagine starting from today, but there is every reason to believe the consequences of molecular engineering will be more profound in every way than those that followed the development of electronics or computers.

One thing, however, is clear. Unlike all of the industrial revolutions that preceded it, molecular engineering requires, as an essential component, the ability to design, model, and simulate molecular structures using computers.

Computer-aided design has been largely an adjunct to engineering so far. It has promised productivity gains, cost savings, and other benefits but except at the leading edge, as in VLSI design, has rarely been an indispensable component of the design process.

But with molecules, if you can't model it, you can't build it. Computer-aided molecular design is one of the key enabling technologies of these imminent industrial revolutions, and stands to benefit both by helping to bring them about, and to profit from the fruits of their success. A computer-aided design company that comprehends, throughout the organization, what is about to happen and takes the small, cautious, prudent steps today to position itself to ride this next wave, stands an excellent chance of emerging as one of the dominant industries on the planet as molecular engineering supplants our present technological base to the degree that integrated circuits have replaced vacuum tubes and electricity has displaced steam engines.

"Leverage" is commonly used these days in a financial sense to mean risk/reward amplification through the assumption of debt. But there are many kinds of leverage. Technological leverage, the power born of knowledge, is supreme among all forms. We used it to build Autodesk into the company it is today, fending off competitors with far more money and people by simply knowing where technology had to go and hitching a ride. Autodesk is, at this moment, the preeminent global force in computer-aided design. Around the world, technology is poised at the threshold of access to capabilities scarcely imagined a decade ago, and computer-aided design is an essential component of this next chapter in the human adventure. The technological leverage of this next industrial revolution is ours, if we want it.

The lever pivots on the micrometer technology of the microprocessor. At one end, we reach to grasp it with our meter-scale human hands, at the other, it manipulates atoms to designs born of the human imagination. With this lever, and the knowledge, courage, and vision to operate it wisely, we can truly move the world. ■

BUSINESS SOLUTIONS

Continued from page 84

where to start or stop when writing job descriptions, he said.

Faced with the task of developing standardized job descriptions for the food processing industry, and seeking to avoid the pitfalls of such a large task, Klick and his committee that was recruited to draft the job descriptions turned to DescriptionsWrite Now!.

Klick's committee consisted of human resource executives from member companies, all of whom were familiar with the effort it takes to develop position descriptions. The committee had agreed that each job description should include the supervisory responsibilities, the required qualifications, the physical demands, and the work environment. In short, they planned to develop thorough and complete position descriptions for use by individual companies in the food processing industry.

"As a result of our collective experience in this area, we knew the tremendous amount of time it would take to create these descriptions, thus we originally planned to develop generic descriptions for only fifty of the most common positions," Klick stated.

"However, as we began using the DescriptionsWrite Now! we discovered that not only does it provide simple menus that describe these functions, but the program includes capabilities that enabled us to quickly customize each job function. The Custom-write feature asked questions about a post and then wrote language to describe its supervisory responsibilities and job qualifications, as well as the necessary experience, education, reasoning, math, and language ability.

"The information gathered from the Custom-write questionnaire provided us with a complete and accurate picture of each position before starting the description. As a result, the committee only had to prepare a summary of each job and its essential duties. Using Descriptions WriteNow!, the committee wrote fifty job descriptions in such a short period of time, we were able to eventually write 160 position descriptions ranging from blue collar to executive posts!"

The software package includes duties for more than twenty-four hundred job titles, which the committee was able to access through alphabetical, functional, or keyword search. "This feature was extremely helpful when we were attempting to locate a specific position from thousands of titles," Klick noted.

DescriptionsWrite Now! was invaluable in helping the committee create position descriptions that accurately reflected the essential duties of most jobs in our industry. The software package provided the committee a jump-start in writing the descriptions, and virtually eliminated the intimidation that often accompanies their development, he said. "We are now able to write a whole job description in thirty minutes and are finding that as we become more familiar with the program we are creating descriptions even faster," Klick added.

The final job descriptions will also serve as a basis from which the association's member companies can tailor position descriptions to match individual requirements. The package's built-in editor and text import and export capabilities allow managers to easily modify or update a position description to match the needs of their company or make changes as the functions of a job change.

These new job descriptions will benefit the employee by giving an accurate description of what is required for a given job. In addition, an employer can easily provide employees with a comprehensive overview of a job that includes not just the qualifications required, but the job's environmental and physical factors. ■

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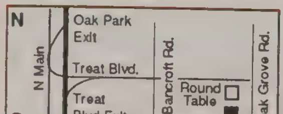

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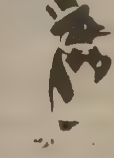

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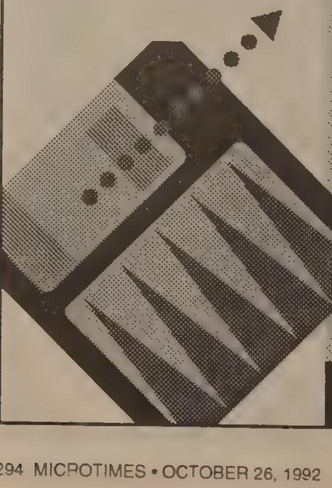

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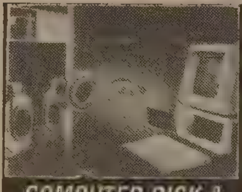

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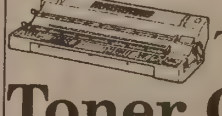

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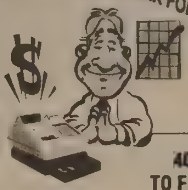

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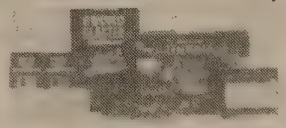

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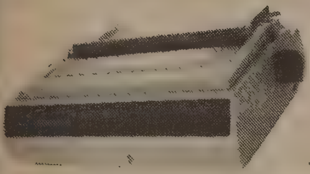

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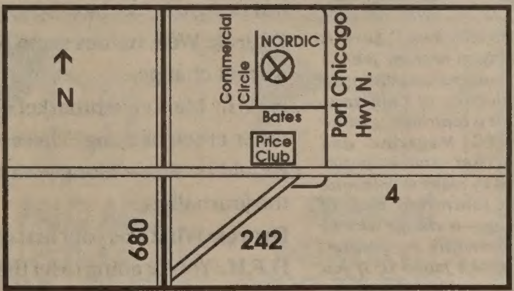

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Frowsy Anal Retentive Twits For Perot

An Interview With One Of The Industry Pioneers

BY JOHN C. DVORAK

Howard F. Howard, known as the Old F.A.R.T. of computing, was granting one of the few interviews he'd ever given. Luckily it was with me.

Dvorak: Well, Mr. Howard, on behalf of *MicroTimes* I want to thank you for the chance to interview you. You're very well known in the computer community.

H.F.H.: Then interview me. Why waste time with all the fussing and brown-nosing? You young punks don't have a clue, do you?

Dvorak: Well, maybe, maybe not. Anyway, how did you get started in computing?

DVORAK'S LAST COLUMN

H.F.H.: The ENIAC was the first machine I programmed on. You kids don't know how rough it was back then to get an answer to a simple calculation request. And, later, when the big disks came along—man they were something. It took weeks for one to get up to speed. It took days and days to do a cold boot back when I was a kid. Nowadays people complain about waiting a few seconds. What's wrong with the world that it can't wait a few seconds?

Dvorak: You were involved in the early days of personal computers too.

H.F.H.: Microcomputers, dammit. Microcomputers. Don't they teach you anything in school? Personal computers schmersonal computers. Who dreams up these names? They were invented as microcomputers. How did they change to personal computers? Do you know them personally?

Then we have desktop computers. To me that means a big flat desktop onto which you put things. A "desktop" computer...get it?

Dvorak: Well, names seem to change as the market changes.

H.F.H.: Market schmarket. This is just another crock of dung. These marketing guys should be shot—along with the lawyers and the journalists.

Dvorak: What was your first microcomputer?

H.F.H.: You're going to let that last comment slide? Wimp!

OK, my first microcomputer was an Altair 8800—a man's machine until that punk kid Bill Gates put BASIC on it. That was the day the dream died.

© 1992 by John C. Dvorak. All rights reserved. John C. Dvorak graduated from the University of California. He is a contributing editor of PC Magazine and MacUser, and is considered by many to epitomize the contrarian view of things—a charge that he vehemently denies. Dvorak's motto is: If you have nothing nice to say, then don't say anything at all.

Dvorak: That was almost immediately. How could the dream die because of BASIC?

H.F.H.: Real men don't code in BASIC. They code with panel switches in machine code, right into the computer itself. None of this sissy high-level language stuff.

Dvorak: So I take it you don't like Windows or anything with a GUI interface?

H.F.H.: GUI schmooey. Heck, GUI phooey, ptooey. When I was a kid we didn't even have a command line. We told the machine in binary what we wanted it to do. Now everyone wants to point and shoot, click click, point and shoot. Tell them to go get a dog and go duck hunting.

Dvorak: So why did you call me in here for the interview? You must have something specific you want to chat about.

H.F.H.: It's this Ross Perot guy. Is this column running before the election?

Dvorak: Actually it comes out around election time. Most people will be reading this interview after the election is over.

H.F.H.: No matter. Ross isn't going to win anyway. I just wanted to let all the old F.A.R.T.s out there like me know that he is our man. We need someone like him in the White House.

I realized that Frowsy Anal Retentive Twits were all the same kind of jerk. Kind of like me. There are a lot of different kinds, physically. But all of these people are the same breed and Ross Perot is one of them.

Just listen to that marvelous voice as he screeches out his plan for the country. Computer users love him. That haircut. That voice. I'm telling you, the world wouldbe a different place if it were run by old F.A.R.T.s like him. No more free lunch. No more goofing off.

Dvorak: This is what you asked me here for? This is why you're wasting my time?

I thought this was going to be about computers. All you've done was complain about computers and whine about this and that and then tell me that you like Ross Perot. The guy is a crackpot. Can't you find something better to do with your life than something like this?

H.F.H.: You're turning into an old F.A.R.T. too! It's contagious. It's the future.

> **"I realized that Frowsy Anal Retentive Twits were all the same kind of jerk. Kind of like me. There are a lot of different kinds, physically. But all of these people are the same breed and Ross Perot is one of them.**
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> **"Just listen to that marvelous voice as he screeches out his plan for the country. Computer users love him. That haircut. That voice. I'm telling you, the world would be a different place if it were run by old F.A.R.T.s like him. No more free lunch. No more goofing off."**

It's a trend, Dvorak! Hahahahaha. Anyone who gets this far in reading this interview is doomed too.

He handed me a Perot T-shirt and left laughing. As he wandered off I noticed that his socks didn't match. ■

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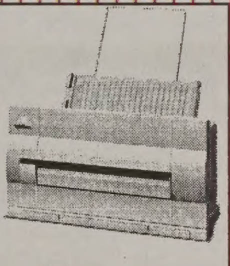

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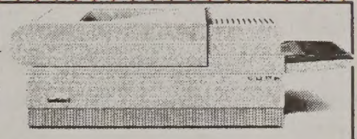

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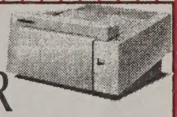

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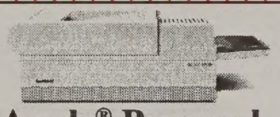

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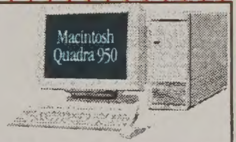

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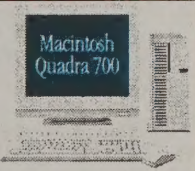

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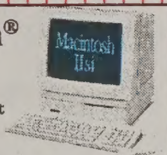

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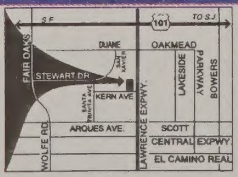

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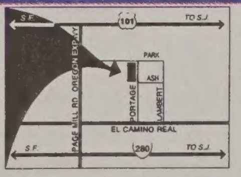

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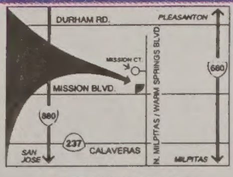

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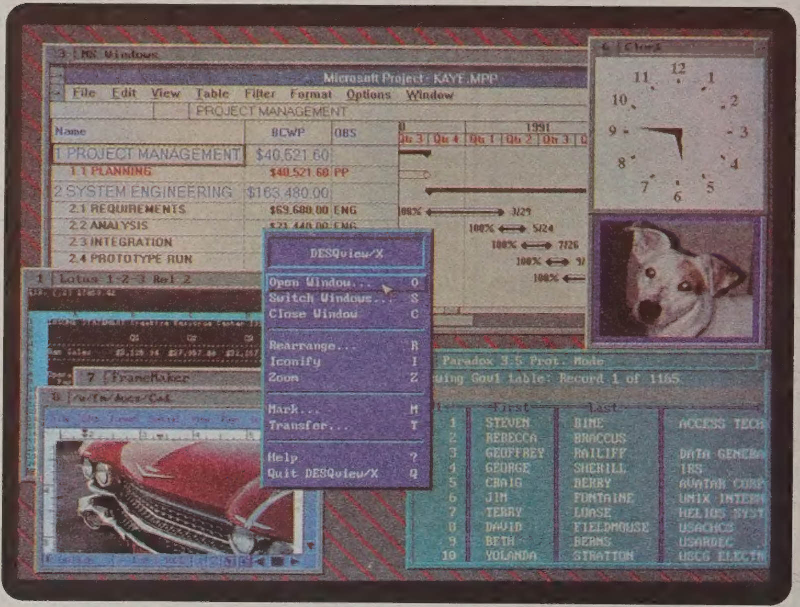
Turn your measly PC into a graphical workstation.

Looks the Way You Want

DESQview/X supports sculptured menus, customizable backgrounds, graphic buttons for launching programs or sets of programs, icons and online context-sensitive help to make computing easy and fun. If you are a DESQview user, you'll find DESQview/X very familiar, with an improved look.

Multitasks DOS & Windows Programs

Quarterdeck is the acknowledged pioneer in multitasking and DESQview/X gives you high performance multitasking, with graphical DOS and MS-Windows programs running side-by-side.


3 MS Windows
Microsoft Project - KAYE.MPP
File Edit View Table Filter Format Options Window
PROJECT MANAGEMENT
Name BCWP OBS
1 PROJECT MANAGEMENT $40,521.60
1.1 PLANNING $40,521.60 PP
2 SYSTEM ENGINEERING $163,480.00
2.1 REQUIREMENTS $69,680.00 ENG
2.2 ANALYSIS
2.3 INTEGRATION
2.4 PROTOTYPE RUN
6 Clock
1 Lotus 1-2-3 Rel 2
7 FrameMaker
DESQview/X
Open Window... O
Switch Windows... S
Close Window C
Rearrange... R
Iconify I
Zoom Z
Mark... M
Transfer... T
Help ?
Quit DESQview/X Q
Paradox 3.5 Prot. Mode
First
Last
1 STEVEN BINE ACCESS TECH
2 REBECCA BRACCUS
3 GEOFFREY RAILIFF DATA GENERA
4 GEORGE SHERILL IBS
5 CRAIG DERRY AVATAR CORP
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Works the Way You Want

Move immediately from one program to the next. Mark and transfer text. Define keystroke or button-driven macros. Set up sets of programs to open together at a keystroke or mouse click so you're ready to work on your projects. You can change menus, add sub-menus. Change commands. What's more, you can specify window size and color. And if you are using DOS text programs, you can set them up so that the font changes size as you change the size of the window. We call this feature scalable DOS windows (see the Lotus window on the right side of the screen).

DESQview/X is a powerful, efficient environment for increasing productivity.

DESQview/X gives you an efficient graphical multitasking windowing environment with a doorway to the future

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At last. For everyone waiting for a GUI (graphical user interface) that doesn't demand a major sacrifice in speed and hardware overhead, we present The Answer.

DESQview/X is a joy to use, with its editable pop-up menus, customizable backgrounds and icons. With its built-in Adobe Type Manager, it gives you highly readable scalable DOS windows. It gives you mouse control and keyboard equivalents for every command. It lets you define keystroke macros to speed repetitive tasks. File management and mark and transfer. It gives you 8514/A, Super VGA and DGIS high resolution graphics support for great detail and more windows. Plus maximum memory usage with our best-selling QEMM-386 memory manager—included with DESQview/X.

1991 BYTE AWARDS OF EXCELLENCE

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	OSF/Motif interface			$250.00	
	Shipping & Handling $10 (Canada & USA only)				
	California Residents add 8.25%				
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